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THE TECHNICAL MAGAZINE FOR MANUFACTURERS OF PAINT, VARNISH, LACQUER AND OTHER SYNTHETIC FINISHES

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1951 REVIEW
SEE PAGE 18

JANUARY
1952

REICHHOLD



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CHECK THESE RCI RESINS AGAINST THE GOVERNMENT SPECIFICATIONS THEY MEET OR EXCEED!

CHEMICALS



Government Specifications	RCI Resins
Jan-G-276, Type II, Class C	1204 Synthe-Copal
MIL-R-15184, Ships	RM-254 Super-Beckacite
MIL-R-15189, Ships	3011 Super-Beckacite
MIL-R-15190A	P-27 Beckosol
52-MC-501, Grade I	P-381-70 Beckosol
52-MC-501, Grade II	P-381-60 Beckosol
TT-R-266:	
Type I, Class A	P-296-70 Beckosol
Type I, Class B	P-296-60 Beckosol
Type II, Class A	P-381-70 Beckosol
Type II, Class B	P-381-60 Beckosol
Type III	P-671 Beckosol
TT-R-271	RM-254 Super-Beckacite

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PAINT and VARNISH Production

Formerly PAINT and VARNISH PRODUCTION MANAGER
(Established in 1910 as The Paint and Varnish Record)

VOL. 42 JANUARY 1952 NO. 1

NEXT ISSUE

The effect of platy pigments in the formation and behavior of paint films has been given considerable attention in the literature. In this connection, the February issue will contain an interesting article dealing with recent experimental work with this material in various paint systems and results obtained with these systems in various exposures.

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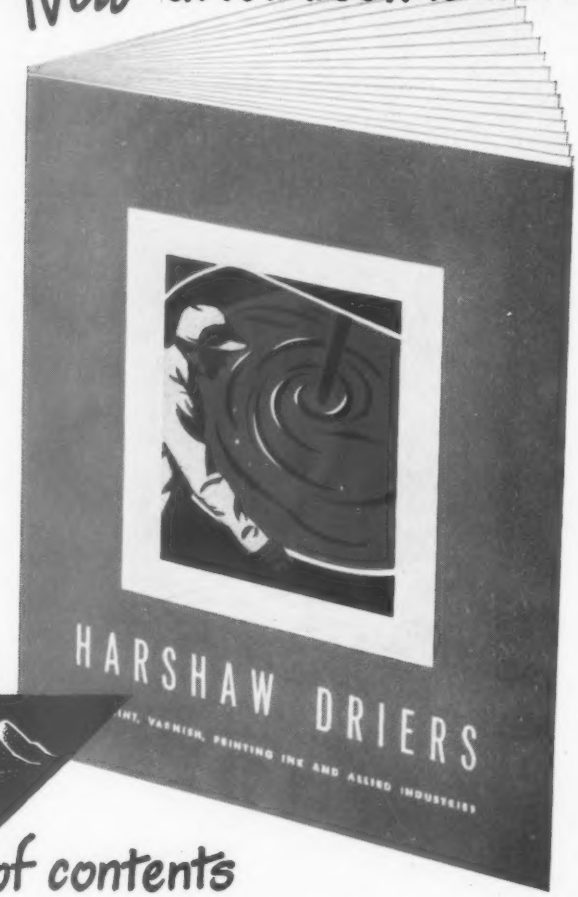
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Editorial Comment

Outlook For 1952

IN making his annual forecast for the paint industry, Arthur W. Steudel, president of Sherwin-Williams Company, predicted that 1952 will be a good paint year and should compare favorably with 1951, which showed an increase of approximately 17 percent in sales over 1950.

"The extremely high cost of replacing existing homes and buildings at today's prices makes it almost imperative that any home owner, building or plant owner maintain his present property in the best possible condition. There is no known way of maintaining and protecting this property as efficiently and economically as with paint — both exterior and interior."

"Statistics show that property kept well painted has a greatly increased value, both for re-sale and rental standpoint, as compared with unpainted or poorly painted property."

Mr. Steudel pointed out that the increasing use of interior paints and enamels for decorative purposes has resulted in a great increase in the sale and production of Sherwin's household finishes. This is evidenced by the fact that over ten million gallons of "Super Kem Tone" was sold since its introduction last year, and over 20 million gallons of "Kem-Glo" since it was marketed in 1949.

In addition, incoming orders from Sherwin's dealers are in great volume, indicating that most dealers have leveled off their inventories through good consumer sales, and are now placing orders to replenish their stocks to a healthy and normal point in keeping with their customer's requirements.

Mr. Steudel is of the opinion that in spite of the gradually tightening of raw materials, there will be sufficient paint products available in 1952 to take care of requirements for household paints for civilian use unless new restrictions are added.

In summarizing, Mr. Steudel made one important qualification which should be heeded by all. He said, "All in all, barring anything that is unforeseen now, I think that we should have another favorable year in 1952, but I would like to close with the only qualification I would put on it — IF WE ALL TAKE OUR COATS OFF AND GO TO WORK."

New Treated Oil

A specially treated fish oil which can be used instead of linseed or tung has recently been developed by an Italian firm. This oil is obtained from pilchards and boiled under vacuum, and then refined and treated with propane in a solexol extractive process. It is claimed to be highly resistant to sea-water and to lose its original fishy smell entirely in processing. The color of the oil is very clear, and its acidity is so low that it can be used with basic and reactive pigments without thickening or clotting.

This new processed oil which should find considerable use in paints, varnishes and allied products will be watched with interest.

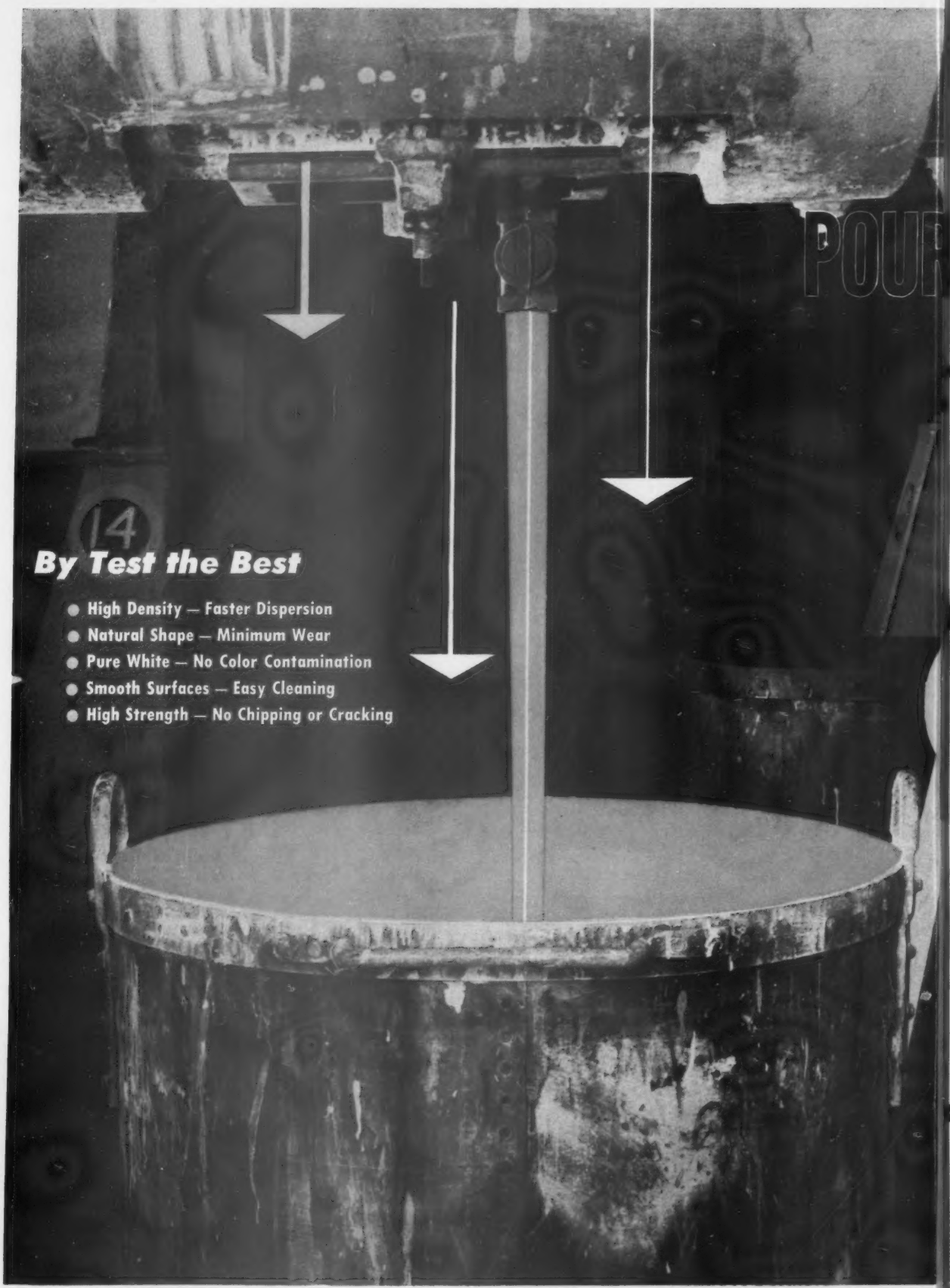
Corrosion By Bacteria

DID you know that anerobic bacteria can cause tiny holes in steel pipes? Some seven years ago Shell Oil discovered that the steel pipes which lined their California oil wells were leaking. Holes in the 3/8 inch casing allowed gas and oil to escape and let in salt water from rock strata above the oil deposits.

In tackling the leakage problem, the engineers at first suspected conventional causes such as mechanical failure, salt water, galvanic corrosion and chemicals in the soil. But none checked.

After seven years of exhaustive investigations, the engineers became puzzled over the fact that black scale around the pitted areas of the pipe contained ferrous sulphide. It was known that the rock contained sulphate but to change it sulphide required oxygen, which they were sure was not present.

A check of the literature revealed that certain species of anaerobic bacteria are able to convert sulphate to sulphides and also attack steel.


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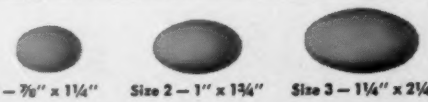
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PAINT PROTECTION

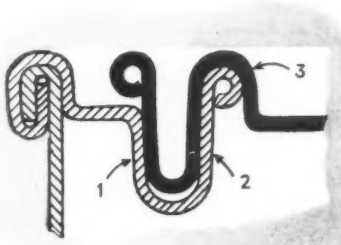


THE SLIGHTEST LEAK at the lid seat of a paint can invites oxidation even before your product reaches the customer. On re-closing, a friction-top that doesn't give a positive seal speeds formation of paint skin—messy to deal with and 100% wasteful.



TOP PROTECTION against paint skin is assured by Continental's "Tripletite" Can. It keeps air *outside,* where it belongs. Available in every size from the small touch-up can to the gallon housepaint pail. In any size, this can gives your product extra protection plus a quality appearance.

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CONTINENTAL CAN COMPANY

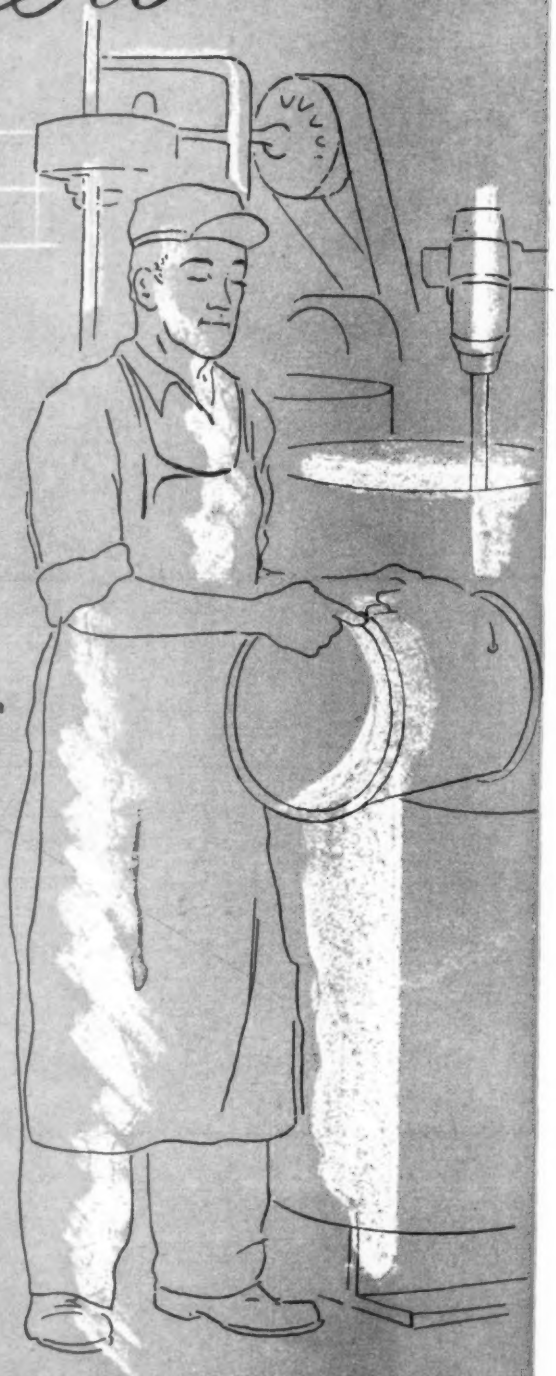
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AROFLAT 3050 is made from non-critical raw materials, so you can be assured of ready availability. Contact your nearest U.S.I. office *today* for complete technical information.

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Solvent	Mineral Spirits
Viscosity (G-H)	P-W
Acid Number of Non-Volatile	10 Max.
Color (Gardner Standards '33)	10 Max.
Approximate Range, Wt./Gal. @ 25° C. (Solution)	7.2-7.3 lbs.

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FIRM _____ **ADDRESS** _____

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"LEAD" house paints have "staying power"

because lead pigment stabilizes the film

***Surfaces* Look Better...Longer**

After prolonged exposure under different climatic conditions, the house paint containing white lead on these test panels is still as durable as it looks . . . a continuous surface without cracks . . . the best argument for using lead pigment in *your* paint formulations.

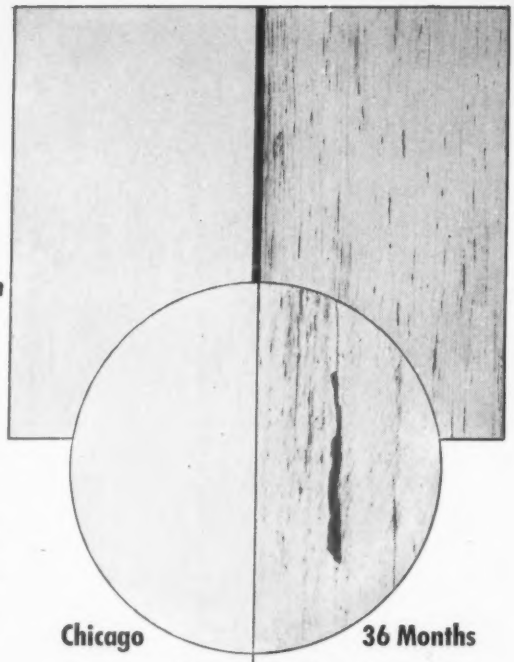
Chicago's industrial gases and rapid temperature changes, as well as Florida's moisture and sun-bake treatment, failed to permeate or crack the protective film of the "lead" paints because white lead neutralizes and stabilizes the decomposition products of the vehicle by forming stable, insoluble lead salts, giving the paint a tough, resilient film.

These exposure tests show why it pays to include "lead" in your paint formulations . . . it gives paint the "staying power" that keeps it looking fresher—longer . . . a powerful sales argument.

For detailed information on the most effective use of "lead" in your paints . . . write to *Lead Industries Association, 420 Lexington Avenue, New York 17.*

TWO SEVERE EXPOSURE TESTS

Photographs of test panels (inserts, twice actual size) show how properly lead-pigmented paints retain their elasticity, toughness, staying power . . . and appearance.



Pigmentation

LEAD	NON-LEAD
31% White lead	36% Zinc Oxide
30% Zinc Oxide	9% Rutile TiO_2
7% Rutile TiO_2	13% Anatase TiO_2
7% Anatase TiO_2	42% Extender
25% Extender	

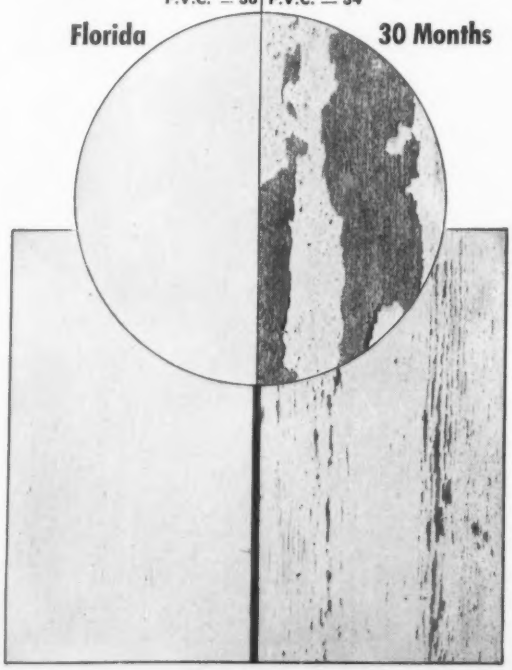
Self-Primed, south vertical, White Pine.

LEAD **NON-LEAD**

Vehicle

Both formulations contain the same bodied oil type vehicle.

P.V.C. = 36 **P.V.C. = 34**



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It Stabilizes . . . neutralizes acidic compounds resulting from the decomposition of the vehicle—prevents the film from becoming soft or liquefying.

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It Strengthens . . . flexible, spiney lead soap particles mechanically reinforce the film and increase elastic strength.

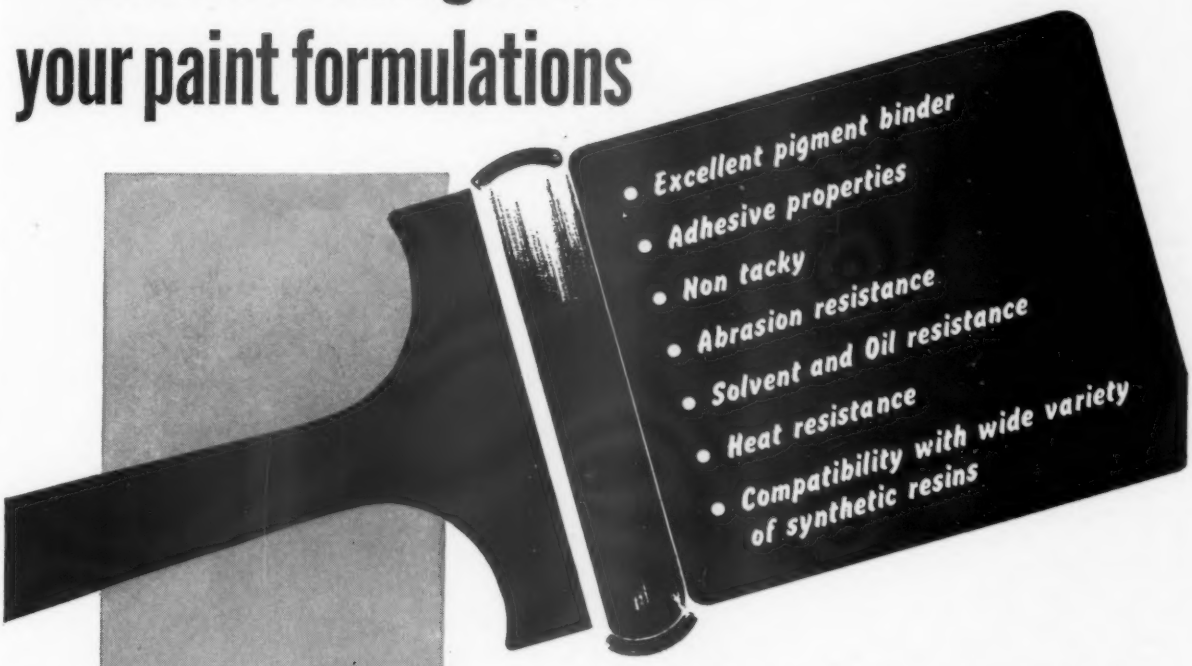
It Resists Water . . . paint films with an optimum lead pigment content absorb only a small fraction as much water as do lead-free paints.

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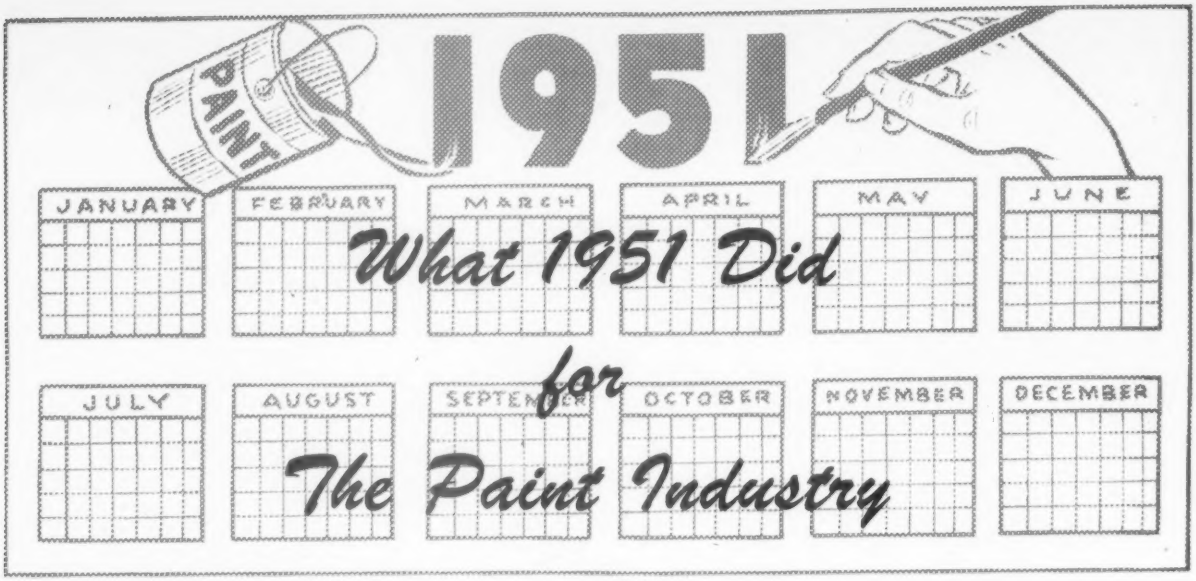
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(If experimental samples wanted, please check here____)

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Company____
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City____ Zone____ State____

GEON polyvinyl materials • HYCAR American rubber • GOOD-RITE chemicals and plasticizers • HARMON organic colors



What 1951 Did for The Paint Industry

By

GEORGE S. COOK HOWARD C. WOODRUFF

General Electric Co.

THE PREVAILING business mood of 1951 was one of uncertainty. The uncertainty resulted from:

1. Unpredictable fluctuations in demand for paint products with demand moving from normal purchases to scare hoarding followed by the doldrums.
2. Raw materials presented a doubly confused picture with supplies either drying up or prices gyrating.
3. Non-materialization of anticipated volume Government buying because of frequent revisions of their time tables.
4. Commercialization of new technical developments with the paint manufacturers feeling the demand for their normal product lines subject to attack by consumer acceptance of new coating materials.

The technologists, being surrounded by an uncertain business picture, brought their skills to the problems of getting alternates for raw materials that were scarce and potentially scarce for years to come or toward getting new materials to meet new use requirements. This effort was in addition to their continued steps toward product improvement.

The opinions and veiwpoints expressed herein are those of the authors and not necessarily those of any company or the Paint and Varnish Production.

Day to day business puts such pressures on our time and effort that new knowledge about products, technical advances and industry situations can only be absorbed "on the run" and rarely digested. This often results in a disconnected series of impressions about the many phases of our expanding industry.

The doings and accomplishments of 1951 were reviewed and digested by the authors as a step toward connected information. Although every attempt was made to make this summary (from Jan. 1 to Nov. 1, 1951) as complete as possible, some significant developments may have been inadvertently overlooked. As you use this review as a check list to see if you missed anything or inadequately appraised some developments, note any omission that has been made and let us know.

Economic

A NEW factor of government control has risen to exert an influence of ever increasing importance on the manufacturing industries. Normally a manufacturer is able to keep his prices at least abreast of the increases of doing business which includes wages, raw materials, transportation, taxes and the like. However, the squeeze on profits is now on with prices of finished goods lagging behind the increases in cost. The manufacturer has only a few choices in order to ease his dilemma:

1. Upgrade the product line to a higher profit margin.
2. Invest in research to develop new, longer profit items.
3. Review production practices to take advantage of the newest and most economical techniques and equipment.

Normally, population growth and industrial needs determine the extent of paint sales. The demand of the government for finishes is becoming of greater interest, however, as the mobilization plans whip into full gear and reach the point where equipment comes off the assembly line. Such government demand did not materialize early enough this year to relieve some of the distressing downturn in demand for paint goods experienced during the third quarter. However, it was of note that the southwest and far west experienced little of the downturn that hit the eastern paint manufacturers. This was primarily a result of the growing population, housing and industrial boom being experienced by the west which caused all time highs in demand for paint products in those areas.

Latex Paints

THE ranks of companies offering latex base paints were swelled by the additions of Pittsburgh Plate Glass, W. P. Fuller, Benjamin Moore, Muralo, Wesco Waterpaints, National Chemical



Mixer for Liquids and Pastes

Mfg. with many more considering the shift being sparked by the two leaders, Glidden and Sherwin-Williams. Producers of both the styrene-butadiene or plasticized styrene latices suitable for making these emulsion coatings were kept hopping to keep up with the demand and include Dow, Monsanto, American Polymer, Dewey and Almy, and Naugatuck Chemical.[102]

Continental Paint Co. of Chicago was even pushing the use of latex emulsion paints further by going into production on a butadiene-styrene paint for exterior applications.

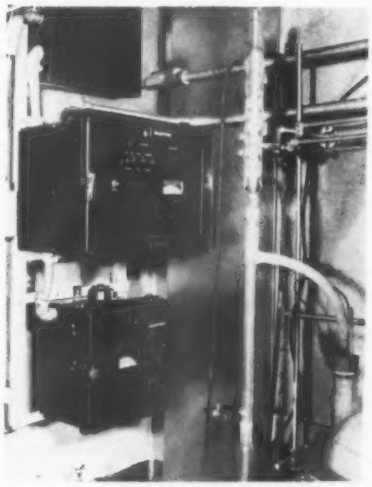
Styrene Emulsion Paints

USE of styrene as a raw material for the coatings industry increased to the production limits of styrene. Styrenated alkyds were in increasing demand but in the field of emulsion paints, styrene probably made faster gains than any other film former.

England also finds the market for styrene booming. Fourth Chemicals, Ltd. whose styrene monomer plant at Grangemouth, England was scheduled to be in production in 1952 is planning an expansion to be completed in 1954.[104] Styrene is, at present, using about one-third of the benzene produced. It is estimated that by 1955, one-half of the benzene production will be consumed by the styrene manufacturers.

Hahn[63] illustrates some general principles of formulating paints made with polystyrene as follows:

1. Slow speed mixing equipment is suitable for making flat pigment finishes.
2. High speed mixers are necessary for clear films.
3. Manufacturing steps are: Formation of emulsifier; Emulsification of plasticizer; Addition and solution of polystyrene dispersion.
4. Pigments used should possess good alkali resistance, and low water soluble salts.
5. Emulsifier should aid pigment dispersion, emulsification of plasticizer, freeze-thaw and package stability, and washability.
6. Defoamers such as glycerol mono-ricinoleate lower viscosity, reduce water requirements and achieve better solubility of styrene.
7. Plasticizer must be compatible with a solvent for polystyrene, fluid at room temperature, present in sufficient volume to dissolve all the polystyrene and must be emulsifiable.
8. Wetting against should be included near completion of batch since earlier additions increase foaming.
9. Thickeners may be required and methyl cellulose and sodium polyacrylate have been found suitable.
10. Tinting employs suitable pigments ground in water soluble resins.



Control Unit for Cooking Varnishes

Some precautionary notes were suggested by Brenneck[65] as follows:

1. Phenolic lined drums are necessary to prevent corrosion by and contamination of the emulsion product.
2. Black iron, galvanized or copper processing equipment is to be avoided.
3. Care should be exercised in processing to prevent excessive temperature formation.
4. Gloss of the coating depends on the pigments used, wetting agents, amount of plasticizer, pigment-vehicle ratio, use of xylene or methyl cellosolve emulsions.

Vinyls

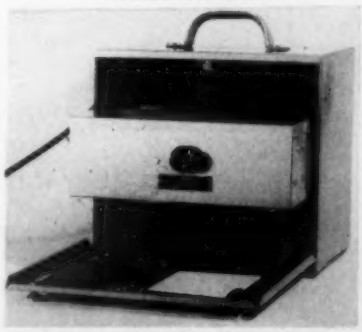
ALTHOUGH vinyls were harassed by shortages of chlorine and other raw materials, they were finding wider uses in water based emulsion, plastisols (vinyls dispersed in plasticizer), organosols (vinyl dispersed in organic solvents), and water solutions (vinyls dissolved in water). Vinyl copolymers were becoming of increasing importance with vinyl toluol resins going into pilot plant stage with estimated volume production by 1953.

Port[142] issued a comprehensive report covering the techniques for polymerization and isolation of vinyl caprylate, caprate, laurate, myristate, palmitate, and stearates as well as describing the methods of isolation and purification of the polymers. Pfeiffer[11] obtained stable vinyl coatings on metals such as tin and iron by first oxidizing the metal surface. Voshinaga[144] found methyl vinyl ketone polymers to have high flexibility, good oil resistance and excellent adhesive properties. Henn[19] sought to correct the problems involved in solvents for vinyls by obtaining substitutes for the expensive and difficult to obtain cyclohexanone. He developed a three component system containing 37 to 65% cyclic ketone, 10 to 50% aliphatic ketone and 8 to 30% toluol which he reports to give equal solubility to the hexanone. Barret[18] covered copolymers of vinyl with maleic type esters in a solvent system, while Peters[46] developed a cyclopentadiene- vinyl acetate copolymer which is compatible with nitrocellulose. Klein[28] achieved viscosity control of vinyl plastisols by the use of amine derivatives.

The principle factor influencing quality of grind, age stability, and viscosity characteristics of enamels using the vinyl dispersion resin is the ratio of dispersants such as the plasticizers, ketones and esters to the diluents such as the aromatic and aliphatic hydrocarbons states Patton.[63] Too much diluents results in flocculation and too much- dispersant results in excessive swelling of the resin particles. Cracking of the film during drying may be corrected by:

1. Use of stronger dispersants to develop slight tackiness of surface of each resin particle.
2. Applying drying heat rapidly so that resin particles fuse before all solvent has volatilized.

Portable Glossmeter



3. Adding compatible resins, such as n-butyl methacrylate. An outstanding advantage of the vinyl organosol is that mild prebake of 150°F enables the coating to be easily sanded with the highly smoother coating then fused into a tough glossy finish with a bake at 350°F.

Primers for the vinyl dispersion resin may include a blue lead dispersion in vinyl chloride-acetate resin plus a small amount of a carboxyl bearing vinyl chloride-acetate resin added prior to application. The lead pigment rapidly reacts with the carboxyl bearing resin. The addition of a hydroxyl-bearing vinyl chloride-acetate resin to an organosol will improve adhesion to the wash primer.

In a study of vinyls for use in fresh water immersion, Rohwedder[81] found:

1. Wash primer and carboxyl containing vinyls give equal performance.
2. Vinyl films appear to have better erosion resistance than phenolics.
3. Blends of appropriate vinyls with phenolics appear promising.
4. Pigment type is of less influence on performance in vinyl vehicles.
5. Vinyl films blister less than phenolics.
6. Intercoat adhesion of vinyls is no problem.

Canadian Industries Ltd.[23] succeeded in developing hydroxyl esters by the reaction of acids with 4-vinylcyclohexene dioxide to serve as a potential resin intermediate. General Electric Company[8] developed copolymers of 2-vinyl dibenzofuran with butadiene, styrene, etc. Standard Oil[33] patented the use of vinyl resins plasticized with liquid copolymers from a diolefin — such as butadiene — and acrylonitrile.

Alkyd Situation — 1951

IN 1951 alkyd resin producers were confronted with problems arising from changed consumer demands, competitive pressure, and an uncertain raw material situation.

For civilian use, consumers spoke for faster drying times coupled with high durability and good color retention. For military use increasing demands appeared for improved quality in all directions, specifications being tightened up on color, composition, drying time. All these changes were required in an atmosphere of low prices carried over from the previous year.

Competitive pressure from vinyl paints and latex paints added to a scene with a rapidly changing background.

At the same time there was not always enough phthalic anhydride to make enough alkyds to fill the large volume of non-D.O. business available during the first half of the year; glycerine remained high in price, while the whole-oil market tumbled drastically in the middle of the year, and fractionally separated fatty acids and fatty acids from foods became available in quantity; styrene, the much heralded new alkyd modifier, was restricted in supply.

As a result of pressures from these three directions a number of manufacturers restricted production on their established lines of alkyds and reemphasized customer evaluation of alkyds based on alternates to one or more of the conventional phthalic anhydride, glycerine, and whole drying oil type raw materials.

Polybasic Acids for Alkyds — Although the production capacity of phthalic anhydride is said to be improving, substantial increases will not be achieved before late 1952. Phthalic from orthoxylene is being actively studied but is not as attractive economically with total potential production at 60 million pounds.[84] As a new method for phthalic production *British Coal Utilization Research Association* has developed a new process on a laboratory scale for the preparation of P. A. by the oxidation of phenanthrene in a fluidized bed with sodium-vanadium pentoxide. They obtain a 55% yield using an anthracene product obtained from fractionating coal tar.[100]

Still better utilization of existing supplies of phthalic will be achieved by Dewey and Almy of Acton, Mass. who will utilize a 60% distillation residium from the production of 4 million pounds of dioctyl phthalate and 1 million pounds of dibutyl phthalate annually. In addition, By-Product Processing Laboratories will treat a 20% pitch to make the anhydride at the rate of 7,000 lbs. per week in their Hackensack, N. J. plant.[108] Publicker Industries patented a group of alkyds based on tetrahydrophthalic anhydride while Aronite[125] which produces phthalic anhydride from petroleum derived o-xylene, announced a pilot plant turning out isophthalic acid from the meta isomer. The company indicates that samples of the new products will be available by the end of 51. Producers of polyester resins, plasticizer esters, oil modified alkyd resins and alkyd oils will perk their ears up at this latest development because of the unique properties of isophthalic acid which suggest its use in plastics and resin applications.

J. L. Jones and L. O. Ford[14] disclosed a means of getting around the dibasic acid problem by condensing alkyl esters of long chain fatty acids with maleic anhydride and thus building up complexes.

Polytols for Alkyd production — Alkyds were reported to consume ⅓ of the refined glycerine production at present.[124] A monoglyceride product was developed directly from soybean oil to be used as a glycerine replacement.[121]

Meanwhile the government of Columbia is trying to build up a glycerine industry and take advantage of the 2½ million pounds of glycerine a year discarded as waste by soap manufacturers. The first glycerine factory is under construction at Bucaramanga and will produce 50,000 pounds per month by 1952[105]

The amount of pentaerythritol available continued to be far below expectations. Capacity was not increased as rapidly as predicted[98] and formaldehyde (the critical raw material for pentaerythritol production) was not available at all times. Other polytols were reported subject to commercial investigation.

In terms of alkyd properties Muller[85] reported detailed studies on the effect of excess hydroxyl on alkyd resins. He gave quantitative data on the relationship between glycerine hydroxyl excess in alkyds and the water resistance, general durability and other properties of the alkyds.

Further Work on Styrenated Alkyd — A British patent[49] was issued covering the styrenation of an oil-modified alkyd resin in the presence of 0.5 to 5.0% sulfur. With the use of driers, the films became touch-dry in 1 hr. Interchemical Co. succeeded in developing styrenated alkyds compatible with amino resins.[48] To overcome the lack of homogeneity of styrenated alkyds, the styrene can be reacted with a partially polymerized drying oil ester in the presence or absence of solvent, or reacting substantially unbodied oils with a mixture of styrene and alpha methyl styrene[88].

Alkyd Design — A light colored and fast drying alkyd resin compatible with nitrocellulose is obtained by modifying a drying oil alkyd resin with an ester containing a plurality of double bonds, such as allyl phthalate.[12] A Dutch patent[55] was issued covering the manufacture of alkyds resins employing glycidol allyl ether. Allyl and methyallyl alcohols are most readily incorporated through ester interchange combined with the solvent method of esterification. They may also be incorporated by introduction in the form of an ether with another alcohol such as mono allyl ether of glycerol[89].

Dimer acids [90] used in alkyds as a replacement for monobasic acids or as a replacement for phthalic anhydride will modify resin properties as follows:

1. Increased flexibility.
2. Softer and less mar resistant films.
3. Increased viscosity.
4. Poorer color retention for baking resins but no decrease of color retention of air drying resins.
5. No favorable or detrimental



Gas-Heated Mixer

effect on weather exposure.

6. Slower set to touch dry.

7. Decreased wrinkling.

8. Improved through-dry.

Patrick[73] summarizes some data in connection with alkyds and their formulation.

1. A P.A. — glycerine-drying oil alkyd increases in durability as P.A. increases.

2. Pentaerythritol resins give better durability, gloss and color retention over glycerine than comparable glycerine alkyds.

3. Linseed Oil alkyds are superior in gloss retention and durability to soya oil alkyds.

4. Longer oil styrenated alkyds give superior durability to short oil styrenated alkyds.

5. Bronzing is more frequent with styrenated alkyds.

6. Short to med. oil alkyds are more effecting blending agents with amino resins because of superior compatibility and better plasticity.

7. Architectural enamels require gloss and color retention, brushability, mineral spirits solubility and are appropriately filled by the performance of long oil pentaerythritol alkyds.

8. Trim and trellis enamels need a long oil linseed alkyd for compatibility with linseed oil and to improve performance. The alkyd is used for 25 to 75% of the vehicle solids with 40% preferred. Soya alkyds are more thermoplastic and may cause tacky films and wrinkling in summer months.

9. Many, but not all four hour enamels will switch to the use of styrenated alkyds, when developed to be soluble in mineral thinners, because of the dry, superior color and gloss retention as well as water and soap resistance. The odor of styrene continues to be an objection.

10. Porch and deck paints need a med. oil alkyd for good through dry and water resistance such as a soya-glycerine or linseed-pentaerythritol with 35% P. A. Linseed is preferred for optimum film properties and drying properties.

11. Automotive refinishing enamels utilize alkyds in preference to lacquers because of the high gloss obtained without rubbing, as well as better durability. Starting resin formulation could be a 35% P.A. soya-glycerine or linseed -p.e. alkyd modified with a 40% p.a. soya or dehydrated castor alkyd to obtain dry and desired film properties.

12. Traffic paints need fast dry characteristics and high durability for weather and abrasion. A 35% P.A. with the soya-glycerine of linseed-p.e. cut in naphtha is a good start. The pigmentation should include normal hiding pigments plus fibrous talc and barytes to give dense compact structure. Pumice aids reflectivity. A P V of 50% represents best combination of dry and durability.

13. Air dry industrial enamels use a short to med. oil rosin modified resin for low cost enamels whereas farm and railway equip. enamels are similar to automobile refinishing enamels. Automotive undercoats may be based on a 30 to 35% phthalic resins.

14. Baking enamels should use an alkyd with an acid number between 4 and 10 when blended with an amine resin. Dipping enamels require viscosity stability which in turn demands an alkyd-amine combination of high compatibility with the solvents selected to insure performance. General utility baking enamels based on short oil (35% soya alkyd and 20-25% urea.) Use of melamine for urea gives appliance finish. Dehydrated castor for soya gives improved adhesion. Cocoanut oil for soya gives improved color retention. Blends of melamine and urea improves adhesion at expense of color retention and chemical resistance. In general, the melamines offer superior chemical resistance and durability, and faster cure than the urea while the urea is more economical, gives better adhesion, lower solvent resistance, and better low temperature cure.

15. Washing machine enamels need 40% melamine combined with a short oil dehydrated castor alkyd.

Phenolics in 1951

ALTHOUGH the actual use of phenolic materials in coatings was difficult in 1951 due to shortages of both regular phenol and para substituted phenols, basic developments were announced this year which indicated phenolic resins are in a rapid stage of development, and will maintain an important place in an ever changing coating materials industry.

A new method of attaching substituents to the aromatic ring without benefit of chlorination or sulfonation is the basis of the process of making phenol from cumen and air. By-product, acetone, also enhances the use. In the process, isopropyl benzene is oxidized with air to form cumene hydroperoxide which then yields the phenol and acetone. Standard Oil of Calif. is building a million dollar plant at Richmond, Calif. to make 77 million pounds per year. It is believed that the benzene shortage will have been relieved by the time production takes place so that the new plant will not be hampered.[101]

Shell Development Co. has developed a method of coupling phenol or its homologs to poly nuclear hydroxyl compounds with little oxidation by reacting the materials with saturated peroxides.[1]

In studies on furfural-phenol rosin, Imoto[143] showed that the rate of heat hardening of soluble resin was determined by rate constants of the following reactions:

1. Formation of soluble resin by the reaction between soluble resins.
2. Formation of an insoluble resin by reaction between soluble resins, and
3. Formation of an insoluble resin by the reaction between a soluble and insoluble resin.

Deutsche Farben[145] described a new

Resin Disolving Tank



type resin formed under acid conditions by the reaction of xylol and formaldehyde; the mechanism of the reaction not being clearly accounted for. The products, however, have a wide range of compatability, including drying oils, polyvinyl chloride, chlorinated rubber and cellulose derivatives. The resins are non-heat hardening.

Tinnes and Chase of General Electric[96] described a phenolic intermediate R-108 of greater alkali and acid resistance than normal phenolic coatings. These characteristics are reported coupled with good adhesion and flexibility with exceptional abrasion resistance.

Barkhoff[21] disclosed thiophenealdehyde resins blended with oils drying by acid catalysis at 180°C. The coatings are said to be both adhesive and flexible.

Butyl Titanate

AT 200-250°C. butyl titanate splits to yield the hexabutyl dititanate, butene, and butyl alcohol. The dimer hydrolyzes less readily than the butyl titanate and is consequently more useful. A formulation based on zinc dust 56.9%, hexabutyl titanate 20.4% high viscosity ethyl cellulose 0.6% and mineral spirits 23.1% when painted will hydrolyze slowly to yield a polymeric titanate film having good heat resistance, and good adhesion to steel.[152] Ortho ester of titanium may be obtained by reacting an alkyl alcohol with titanium chloride.[151]

Butyl titanate paints have been reported to be suitable for smokestacks and exhaust pipe protection by using two coats of a zinc dust-butyl titanate followed by two-coats of an aluminum-butyl titanate paint.

Epoxy Resins

POLYMERS varying from colorless gels to clear hard solids are obtained by Canadian Industries Ltd.[50] by treating 1,2,epoxy-4 (epoxy ethyl) cyclohexane with stannic chloride, zinc chloride or boron flouride under controlled temperature conditions. Bradley[9] obtained polymers of epoxy resins and phenolic pitches.

Silicones

SILICON containing resinous coating materials continued to be the subject of patent disclosures — of these

F. J. Sowa[16] disclosed a silicone plasticizer based on a castor oil diethyl/silane reaction. Plasticizer for nitrocellulose and ethyl cellulose.

Interchemical[35] disclosed use of arylphosphenic acids to extend heat life of silicones at 500°F.

Dow[54] disclosed film formers from polymers of phenyl ethyl dihydroxy silane.

Thompson-Houston[53] disclosed iron ethyl hexanoate as a stabilizer for silicones.

Safford[44] of G.E. disclosed polymerization of liquid polysiloxane with boron hydride.

Thompson-Houston[52] covered oil modified alkyds free of hydroxyls mixed with alkoxy poly siloxanes as a coating material.

Dow[51] disclosed polymerization organosiloxanes in presence of acid activated bleaching earth.

Diamond Alkali[53] disclosed thermosetting surface coating resins from phenyl orthosilicates and formaldehyde.

In furtherance of the commercial exploitation of silicones Plaskon Division of Libbey Owens Ford decreased the prices of silicone alkyds[109]. General Electric[74] discussed important considerations in the formulation of silicone coatings, pointing to the effect of pigment and drier selection on the storage stability of silicone paints, and emphasizing the importance of correct titanium dioxide to inert ratio.

Allyl Starch

ALLYL starch forms hard, glossy films that polymerize to a highly solvent resistant state, Nordgen reported.[91] It is compatible with a wide range of plasticizers and is soluble in common industrial solvents. By itself, it will become hard and tack-free in six minutes, but as formulated in finishes, it may take as long as two hours depending upon the solvents and plasticizers used. To prevent checking and cracking, 10-30% plasticizer should be used. It is not suitable for outdoor weathering but can be used in furniture lacquers to give cold check resistance and resistance to hot water and steam. Allyl starch has been particularly successful as a vehicle for aluminum powders. It has also been used as a replacement for shellac and shows promise of being an excellent additive to shellac. Chenick[4] disclosed the use of cerium to reduce the baking time of allyl type esters of polybasic acids.

Hard Resins

IN the "hard resin" field, modification of rosin continued to hold interest. Maleic anhydride-pimaric acid resins were reported by Hercules Powder Co.[5] Krumbharr[27] described maleic glycerol reaction products with rosin-phenol formaldehyde. Quebrachitol was found suitable as a polytol for rosin esterification but not for alkyds.[146] Hampton[31] disclosed the use of 0.01 to 5% selenium at 200 to 360°C to decolorize terpene polymers.

Miscellaneous

IN the unsaturate polymer field Rohm and Hass announced a decrease in the price of methyl methacrylate and increased production, but still based on purchased acetone.[122]

Lytton[20] disclosed a coating material based on an acrylonitrite and isobutylene polymer.

Other polyreactant resinous products were made possible by the new availability of isocyanates announced by Monsanto.[120]

Shell[36] covered polyamide resins from 2,4 diamino 2 methyl pentane and polymerized linseed fatty acids.

General Mills[3] covered additional polyfunctional reactants.

Teflon[103] continued to attract interest as a coating material and was investigated as applicable from water dispersion. Furfural, the starting point of a number of polyfunctional systems, production increased from 50 to 70 million lbs. this year.

The plastic materials thiokol, polyethylene, and poly chloro trifluro ethylene used as coatings applied by flame spray were described by Goldberg.[112]

Drying Oils

IN reviewing the drying oil picture, Sorensen[67] pointed out that it is not necessarily the drying characteristics of an oil that determines whether it is used, but, the following:

1. Must be readily available, a stable harvestable crop.
2. Must be practical and inexpensive to process.
3. Must have economically valuable by-products.
4. Must have the ability to dry or be formed into drying oil.
5. Must be priced right.

Sorenson predicts that linseed will continue its preeminent position whereas tung oil's future is questionable because of repeated uncertain availability. Soybean oil is to increase because of price and availability advantages as well as good durability and color retention. Dehydrated castor oil has a fixed place in the industrial picture while fish oils are hindered because of a variable crop. Tall oil is a lusty new comer whose growth is insured by its low cost.

In 1951 the process of oil refining was rapidly moving to a more scientific basis. A full discussion of solvent extraction of oil-seed was published.[117] This covered basic principles and comparison between American and European systems.

The solexol process went into full operation in this country for oil separation, and fatty acid separation developments came along rapidly.

The separation of Fatty Acids by a Urea process was reported in Journal of American Chemical Society.

The fatty acid is warmed with methyl alcohol and urea to precipitate urea complex, and then recrystallized from isopropyl alcohol. The chain length regulates the compounding of the couples. In saturated acids, longer chains increase the yield, whereas increasing unsaturation decreases yield.[12]

T. F. Bradley[86] covered recent advances in drying oil refining and modifications.

At least two new drying oils were described; Kamala oil[119] from India and Sebastiana Lingustriana seed oil was described by Hanks and Potts.[128] This oil originated in Sebastiana seed, native to the Southwest United States contains 5% of presumed 2,4 duodicanoic acid, 35% linolenic and 38% linoleic acids.

Safflower oil, although not commercially available in 1951 was the subject of a detailed study.[130] Information given included:

In a comparative study of safflower oil versus soybean oil in typical alkyds, the following results were obtained:

1. Reaction rate curves of time vs. viscosity or acid number were similar to soya oil.
2. Color from safflower was superior to soya oil.
3. Color retention of films were equal between soya oil and safflower oil.
4. Safflower alkyds dried faster than soya oil alkyds.

Synthetic oils and chemical modification of drying oils was the subject of considerable activity in 1951.

New esterification oils were the xylitol esters of linseed oil fatty acids. Improved drying speed and loss of tack were observed.[129]

Ethylene diamine reaction products with linseed fatty acids were described as resistant to acids and alkalis.[150]

Patents on sorbitol and dipentaerythritol esters were to Interchemical[43] and on polyallyl ether derivatives of sugars to General Mills.[38]

Isocyanate-drying oil reaction products were covered by E. B. Robinson, R. B. Waters in the article "Urethane Oils."[141] They were unstable but had fast dry, alkali and water resistance similar to alkyds. Durability not as good as alkyds. The authors did not substantiate German claims regarding quality of isocyanate products.

Haines & Bilello[60] used Itaconic Acid in upgraded oils.

Better drying characteristics claimed — Itaconic Acid reported as not so reactive as maleic or fumaric acids.

Gutkin[97] reported that oils based on maleic anhydride and its homologues plus polyhydric alcohol have the following properties:

1. Improved in bodying rates.
2. Hardness of Chinawood oil is approached by maleinized fish oil and maleinized linseed oils.
3. Maleinized linseed oils show excellent alkali resistance.
4. Maleinized oils may be used to extend Chinawood oils without degrading properties.
5. Maleinized soy-bean oil rivals dehydrated castor for non-yellowing.

A U.S. Rubber patent[39] disclosed the formation of a rapid drying oil by passing oxygen thru ketene and then thru linseed oil. Much improved drying results.

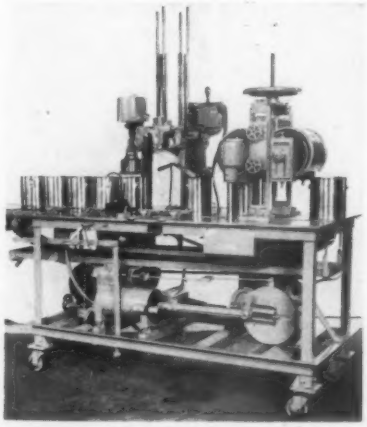
In the field of oil — unsaturated copolymers, Gleason[17] disclosed butadiene drying oil products yielding very hard yet flexible films. He uses a butadiene dimer and a drying oil.

Foster[30] disclosed polymers of unusual adhesion to metals from castor oil monomaleate and styrene.

Bosch & Drubel[110] discussed styrenation of tall oil using styrene and alpha-methyl styrene. Combined amount of styrene is limited by rosin content. Good paint vehicles were claimed.

Drying Oil hydrocarbon copolymers were also described in the patent literature.[6]

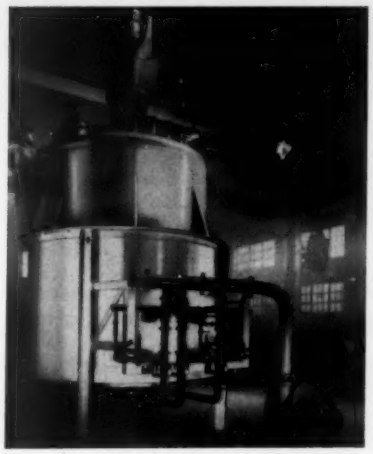
Automatic Paint Filler



Driers

WITH the military taking three-fourths of the supply of naphthanates for use in flame throwers, jelly bombs and for mildew proofing, the paint industry was being forced to switch to tallates.[106] Packer[64] claimed tallate driers of equivalent metal content to naphthanate driers were more susceptible to oxidation because they were made from unsaturated acids. Octoic acid driers had little promise because they were less available than the naphthenates. It was pointed out that manganese and calcium in combination with other driers improved dry while careful drier formulation based on manganese as a top drier could do much to fill the gap when cobalt is absent or present in reduced amounts. Vanadium was found to possess drier activity. Organic driers such as ortho phenanthrolene shows promise when used in combination with metallic driers to enhance effect.

Parker[13] found that dibutyl tartarate, ethyl lactate and diethyl tartarate were useful in stabilizing drier solutions. Elliot[10] reported that diochyl acid orthophosphates were stabilizers as well as viscosity reducers. Loritsch developed[34] a use for peroxide catalysts with a reducing agent to serve as a polymerization catalyst for vinyl systems.



Synthetic Resin Unit

Lacquers

HOT spray lacquers were increasing in popularity for use on furniture, airplanes, autos, military goods and other applications. All phases of the operation were featured by a cooperative exhibit at Paint Industries Show.[87]

In a study on the effect of viscosity of nitrocellulose on performance of lacquers, Berberian[69] found that the lower the viscosity of the NC used, the less is the cold check resistances, and that the viscosity had no significant effect on the print resistance, hardness or rubbing properties of the films.

In an examination of zinc soaps ranging from caproic acid to behemic acid, for use in sanding sealers, Wendt[69a] reported that:

1. Consistency of mill paste increases as the carbon length of the soap increases.
2. Capric, lauric, myristic acids gave good flattening.
3. Many zinc soaps have application in lacquer formulation.

Ulrich[56] claims the market for paper lacquers is greater than lacquers used for automobile finishing and is growing because of the self-help principles used in marketing consumer goods. He gives suggestions for formulating as follows:

1. Glossy, Heat Sealing, Moisture Proof Coating.
   a. SS or alcohol soluble NC is more thermoplastic and furnishes better heat-sealing than typical R.S. nitrocellulose;
   b. Of the nine resins examined, only Petrex T7HT and Neolyn 24 were entirely satisfactory for heat sealing.
   c. Plasticizers for best heat sealing were: (1) Dicyclohexyl phthalate best but high in cost, (2) Dibutyl phthalate second best, (3) Tricresyl phthalate equal to dibutyl but discolored

more, (4) Dioctyl phthalate poorest, (5) Blends of dibutyl and dicyclohexyl advantageous for heat seal plus block resistance.

d. The water vapor proofness needed is obtained from addition of small amount-usually 1-2% — of wax having a melting point higher than 130°F.

e. Where moisture proofness is more necessary, Parlon should be used in place of NC. Wax is still needed and therefore an elevated temperature in the dry cycle is recommended.

2. General Purpose N C Lacquer.

a. Raw castor oil is preferred as a plasticizer because: (1) i gives greatest leeway to formulator in obtaining flexibility, (2) it retains flexibility after aging, (3) it gives best block resistance, (4) However, its odor might be objectionable.

3. Ultra High Gloss Flowback Lacquers. Basic idea is to take advantage of the thermoplasticity of ethyl cellulose by heating at 350°F for short periods after solvent evaporation.

4. Wall paper lacquers. Again ethyl cellulose is the suggestion because of alkali resistance, minimum discoloration, soluble in cheap solvents, low specific gravity, and excellent flexibility.

5. Chemical Resistant Lacquers should utilize the excellent chemical and alcohol resistance of Parlon. Block resistance is achieved by addition of Carnauba Wax, Alkanol B, Nekal A, Dupenol NE, Aerosol OT, Duponal LS, or Paraffin Wax with preference declining in the named order.

6. Grease Proof Lacquers should utilize cellulose acetate of outstanding grease proofness, block resistance, resistance to discoloration and film durability. The objection to using toxic solvents may be overcome by using ethyl acetate, ethyl alcohol and water.

Plasticizers

AIKEN[59] reported on a plasticizer evaluation program with:

1. Tricresyl phosphate, dibutyl phthalate as controls.

2. Dibutyl sebacate, dicyclohexyl sebacate as monomeric sebacates.

3. Butyl glyceryl sebacate, phlypropylene sebacate, castor oil modified sebacic alkyd as polymeric sebacates, and found that: a. In resistance to weathering, the sebacates were superior to any of the controls; b. For resistance to heat, extraction, or migration, the polymeric sebacates were outstanding; c. For plasticizing efficiency, particularly at low temp.; dibutyl sebacate was best followed by dicyclohexyl sebacate; d. Proper combination of the above plasticizers with cellulose nitrate could give any desired range of properties including resistance to heat, extraction and migration.

Filachrone[140] reported that esters of polymeric lactic acid, such as the methyl, ethyl, butyl polylactates were effective plasticizers for ethyl cellulose. Monsanto[45] found that chlorophenoxyacetates were suitable catalysts for use with polyvinylchloride.

Lacquer Thinners

GOTTFRIED[82] reports that a butyl free, ester free thinner of composition:

31 parts methyl isobutyl ketone
8 parts methyl isobutyl carbinol
11 parts isopropyl alcohol
25 parts toluol
25 parts naphtha

This gave performance equal to the butyl rich ester rich AN—TT-T-256 at a fraction of the cost. In addition he reported butyl cellosolve to be the most effective blush retarder of those tested.

Pigments

DURING the year the major emphasis centered, not on the development of new pigments, but on the improvement and development of properties of presently available pigments. The chief approach has been in the seeking after of fine particle size in order to obtain higher tintorial strength and better dispersion. This was achieved by refinements in processing techniques in the manufacture of precipitated pigments, while micronizing was becoming of greater importance in the manufacture of the inorganic pigments.

Dupont continued their studies on the phthalocyanide pigments and developed an ultra fine grade,[40] a beta form,[42] and varied colored metal free pigments.[41] A less abrasive, higher color strength ultramarine blue was developed by Kirmins[26] using controlled precipitation under less alkaline conditions. The process utilizes sodium derivatives of china clay. Amler[2] developed organic reds and yellows from dehydrobenzo (F) quinolin.

Marling[24] disclosed an iron carbonyl as a paint pigment which evidence superior durability on iron and wood surfaces. Froyne[47] developed finer particle size chrome oxide pigments by precipitating as a moist non-aggregate before calcining. Kropa[15] uses a polymeric acryonitrile as a flatting agent as it does not settle or lose its effect on aging. Lead titanate[149] was reported to be extensively used in Holland.

Titanium Dioxide — Despite increases in capacity to produce, production still falls short of demand. The Government's purchases of titanium metal are eating into the rutile deposits in Florida. One of the difficulties is that the separation plant tends to move farther and farther away from the mining operation until the point of "no return" is reached. However, Pritchard has recently developed a sand classifier and flotation separator which will cut down the cost. It will take sand which averages 4-6% heavy mineral and remove 50 to 80% of the unwanted bulk, so that only the desired products are shipped from mining site to processing plant.[99]

Lead Pigments — Stewart[83] explains the function of lead pigments in paint by reactions with acid products of oxidation and film breakdown to stabilize the film chemically, add toughness and strength and impart a high degree of resistance to water absorption. Basic lead compounds substantially perpetuate the pigment structure of a paint film due to being able to form new pigments. Zinc oxide reactions with film acids harden the film and lead compounds plasticize. Best performance need best combination.

Carbon — The best dispersing techniques[57] for carbon blacks depends on the use of a stiff paste mixer or grinding in a steel ball mill with not over 55% steel balls and just enough paste to fill voids. The vehicle is a diluent in the dispersion and the suggested mill base is:

30 parts solid alkyd resin
15 parts high carbon black
55 parts solvent

Reduce solvent content until mix is too heavy to cascade.

For aiding dispersion, 2-4% moisture is a general rule although, with some alkyds up to 10% moisture may be included. Lacquers, on the other hand, may require very dry carbon for obtaining optimum jetness.

Aluminum — Knoll[66] presents numerical data to show:

1. Coarser aluminum pigments leaf faster, give higher total reflectivity, but lower gloss than finer particle sizes.
2. As pigment concentration increases total reflectivity increases but specular gloss decreases.
3. Application to absorbent surfaces causes a decrease in gloss but has no effect on total reflection.
4. Long oil vehicles affect leafing rate and optical properties of fine pigments more than coarse pigments.
5. Solvents of higher surface tension enable pigments to leaf faster.
6. In vehicles that prevented leafing, considerable changes were made in optical properties.
7. Dip, brush, and spray methods of application reduce gloss in order mentioned.
8. In leafing systems, gloss and total reflection demonstrated an inverse relationship.

Formulation and Application

INFORMATION of value to the paint formulator is of two types:

1. General performance characteristics on the materials to be used.
2. General exposure results that evaluate the exposure conditions as well as the comparative performance characteristics of various coating materials.

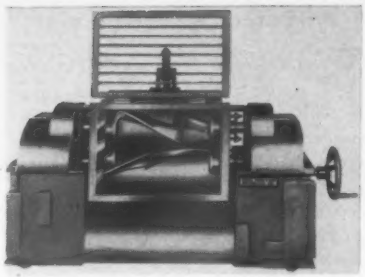
In this summary review, consideration has been given to both.

One development of an unusual character was that reported by Saffie[29] who incorporated glass fibers into film formers in order to improve tensile strength and abrasion resistance. He found that it was desirable to precoat the fibers with a polyamide and that the fibers worked best when from 1/64 to 1/32 of an inch long and from 0.00022 to 0.0048 of an inch in diameter. Along these same lines, Goebel[25] found that the adhesion of an organic film could be increased to glass by the use of coordinated valences of chromium.

Underwater Paints — Elm[78] states that:

1. Films formed by reactions not based on oxygen are more impermeable to moisture than films formed as a result of autoxidation.
2. Pigments aid water impermeability by: a. Forcing water molecules to detour around the pigment particles; b. Reducing free polar groups available in the film; c. Reacting to form soaps.
3. For underwater applications, it is more important that the coatings be an electrolytic barrier than a moisture barrier.
4. Electrolytic resistance of a paint system is largely dependent on the resistance of the system to diffusion of ions and not a function of water permeability.
5. Of the pigments studied the relative electrolytic resistance of aluminum pigment was 28, zinc tetroxychromate 14.5, chrome yellow 2.5, zinc oxide 1.6 with a value of 1 for an unpigmented system. Red lead had a value of 0.75, iron oxide 0.04, zinc yellow 0.02 and silica 0.006 on the same scale.
6. It would appear as if cations are passed through paint films by acidic groups such as –COOH, –OOH, phenolic –OH, and $-SO_3H$ while anion exchange requires presence of basic groups such as $-NH_2$.

Results of an investigation of eight years submersion in fresh water in the Istmus of Panama led Mundt[113] to the following opinions:



Double-Bladed Kneader

1. Zinc-metallizing gave outstanding performance but was not justified if service period is to be five years or less.
2. For priming zinc metallized surfaces, a paint of zinc tetroxychromate in BR 254 with 25 gal. of 60% tung, 40% linseed with a PVR of 65/35 is best.
3. Removal of mill scale is necessary.
4. Film thickness of 4-5 mils min. is necessary for service life of approximately five years.

Cathodic Protection — Cathodic protection in conjunction with protective coatings was receiving more interest and study. Barnard[114] reported that cathodic protection in combination with paints for the protection of ship hulls would probably give a one to two year service life before dry docking was necessary. Sudrabin[79] reports that controlled cathodic protection is necessary for best results even with vinyl type paints and heavy coal tar enamels. The protective current flow should be kept between –0.73 to –0.78 volts when measured against a sat. KCL calomel reference electrode. Currents in excess of this tend to accelerate blistering and destroy the paint film whereas less current only gives partial protection.

Anticorrosive — Kaluch[148] reports that nitrogen resins reduce the solution velocity of metals in a corrosive environment. Vander Valk[75] gives performance results of red lead in linseed oil, alkyd, phenolic, and vinyl resins as the primary pigment as a component of multiple pigments for atmospheric and underwater protective coatings.

Atmospheric — Wirshing[95] reported a theory that paint films fail due to reducing nature of peroxides in presence of moisture. Werthan[123] recommended the reduction of blistering in exterior paints in high humidity exposures by using the following pigmentation composition.

TiO^2	20%
ZnO	30
Basic Lead Carbonate	17
Mica	10
Fibrous Talc	23

Good resistance to weathering, corrosion by salt spray, acids and alkalies were reputed for a system employing mixtures of zinc chlorate and iron oxide followed by selected mica flakes in a thermosetting phenolic-alkyd resin and final waterproof resin pigment layer.[139]

Heat Resistance — Socony-Vacuum developed a metallic paint having colloidal silica solutions as the vehicle with nonleafing metallic particles for a heat resistant finish.[7]

Mildew — Mildew from spores in the atmosphere is of primary concern claims Vicklund.[77] Therefore, resistance of fungicidal paint is largely a function of concentration of fungicide at the surface. Copper 8-quinolinoleate was found to be the most effective fungicidal agent followed by some of the phenyl mercurial compounds and then by chlorinated phenols. These materials will retain their fungicidal activity even with outdoor exposure.

Wetting — Carr[70] suggest a theory that "If wetting is poor, flow properties will be poor because considerable structure formation will take place, but storage properties will be excellent; if wetting is good, storage properties will be poor because there will be insufficient structure formation to prevent the pigments from settling out". Several conclusions may be drawn as follows:

1. Addition of wetting agents should be effective in media of low polarity such as mineral oils, plasticizers, etc.
2. In these media, the use of wetting agents will give ease of grinding, lower oil absorption, and lower viscosity for a given concentration of pigment.
3. The amount of wetting agent must be carefully controlled.
4. With more polar media, the need for added wetting agents should be smaller and the effect of adding such agents less pronounced.

Miscellaneous — In a study on the changes in mechanical properties of paint films with time, Talen[131] reports that:

1. Red lead paints showed an increase in tensile strength but a decrease in elongation break with time.
2. Iron Oxide decreased in tensile strength but increased in elongation with time.
3. Mixtures of the pigments resulted in proportionate changes in performance.

It was reported that the vehicle influences flooding more than the specific gravity or acid value or pigment type.[147] Allyl alcohol esters of oil acids baked at 200 to 450°C were reported by Bent[22] to give surface coatings insoluble in naphtha.

Surface Preparation

WITH producers of usual zinc phosphate metal preparation solutions facing growing competition from

iron phosphate formulation, the zinc phosphate producers are incorporating anti-sludging agents and better accelerators in the solutions. It is estimated that a 20 to 25 million dollar market exists for phosphate coatings, with the iron type having 3 million dollars and the balance zinc. The iron phosphate is used only as a prepaint treatment whereas the zinc is used a great deal for cold forming of metals.[107]

Liebman[72] claims that surface preparation work is a science which adds much to the performance of a coating system. In order to derive the most desirable return from a paint its value must be recognized during the design stages of a product. The cost of preparation of a job can be from 10 to 90% of the total cost of the painting job. He demonstrates the fallacies of painting over rust and scaled surfaces and proposes a set of standards to illustrate the various degrees of surface preparation possible as well as the advantages of each.

Production

MATERIALS handling was receiving greater attention since economies up to 75% in various operations were possible when materials handling techniques were brought into play. Lobdell[58] outlined the basic principles of materials handling as follows:

1. Maintain a straight line of flow of material.
2. Move material in most efficient maximum size units.
3. Use mechanical equipment.
4. Reduce handling to minimum.
5. Maintain flexibility.
6. Use gravity.
7. Modify existing building facilities where necessary.

To reduce materials handling cost:

1. Survey all aspect of your materials handling problem.
2. Study and state basic factors of problem.
3. Study present methods and costs.
4. Develop proposed methods and estimate costs.
5. Determine necessary equipment or new devices to implement proposed methods.
6. Compare present and proposed costs.

The use of instrumentation as a means of obtaining uniform products was described by Procopi[76] as he outlined a control system for varnish cooking that covered:

1. Combustion control to shut off gas burners in case of failure of the gas flame, combustion air blower, gas pressure, or electric or air power supply.
2. Control of inert gas flow within limits of one to fifty pounds per hour.
3. Temperature control which governs rate of combustion as well as rate of cooling by water in the cooling coils.
4. Pressure and vacuum control.
5. Central control room.
6. Finished product control.

The types and functions of rotary pumps for the paint industry were described including rotary pumps that were self priming and would pump any liquid that will flow.[80] Wear of the pumps is influenced by lubricating value of the fluid being pumped, as well as by the quantity of abrasive particles such as silicate particles included in the liquid. Stuffing box packing should be given careful consideration. High temperature products should not be allowed to cool and solidify in the pump. Safety on this is achieved by solvent flushing before shutdown.

Ultrasonics was becoming more practical as a means of obtaining dispersion, with the Brush Development Co.[118] building a pilot plant of 2KW ultrasonic generator. In fact generations of unlimited powers are possible.

Fume control received serious study by Selheimer[71] who developed two procedures for the analysis of fumes from paint and varnish manufacturing processes. The first procedure was developed for the separation of the compounds present in a fume sample into solubility classes. The second procedure was developed to yield data from which the effectiveness and cost of common fume disposal systems can be calculated for any given process.

In a study of dispersion characteristics of roll mills, ball mills and premixers, Baker[68] reports data to show:

1. Paste formulations should be fluid for ball mills, vary stiff for a kneader and in between for a roll mill.
2. Maximum efficiency with a ball mill is obtained when the paste contains small amounts of the resin solids whereas the roll mill and kneader require high solids content.
3. With proper consideration of variables, production from lab mills may be correlated with production equipment and visa-versa.
4. The order of preference for quantity of production rates kneader first, roll mill second and ball mill third.
5. The order of operating efficiency on power requirements rates roll mill first, kneader second and ball mill third.

Test Methods

Dry Time of Traffic Paints — Byerly et al[138] reported on a simple and reproducible method of test for determining the time required to reach the no-dirt-retention stage for traffic paints. They found that a chlorinated rubber-varnish blend reached this stage with 37 min. versus more than 5 hrs. for alkyds.

Reflectance of Traffic Paints — Shelburne[137] reported that the Hunter night visibility meter and a meter developed by Minn. Mining and Mfg. Co. both were useful in evaluating reflectance and durability of reflectance properties of traffic marking paints.

Film Thickness — From a cooperative study[136] of eight film thickness guages, it was found that the equipment usually needed precise calibration; the Magna Guage gave the most consistent results, and that measurement of thickness under 0.2 mils was difficult to do with accuracy.

Others — Wirshing[95] reported a method for correcting the variables in outdoor exposure. Rogers[116] describes a method for measuring electrical resistance of pipe line coatings as well as suggests test and record forms covering preparation and application to final exposure results. Garlock[62] correlates accelerated laboratory settling test with two year stability tests and finds usable correlation for house, trim, flat wall, traffic, and oleoresinous paints. Irish[94] discusses the effectiveness of tests on anti-fouling paints. Alexander[126] shows that a bleaching test method is a reliable guide for evaluating anti-fouling paint formulations. Watson[93] describes the test methods used for testing the stability of latices used in the coating field.

A test for storage stability of alkyds was developed by R. L. Savage and M. C. Schroeder[111] of the *Case Institute of Technology* by measuring the diffraction of a light beam passed thru the alkyd solution. These investigators reported their method gave good correlation with more time consuming methods.

Chemical — Seymore[115] developed a test procedure in which the weight changes of phenol-formaldehyde is determined for various time intervals and specific chemical resistance data is tabulated. The method is good for many chemicals including acids, alkalies, and oils. Shreve[132] finds that an optical density measurement at 276 mu can complete the analysis of phthalic content when the normal Kappelmeier method is interfered with. Kappelmeier[92] identifies styrene in styrenated oils or alkyds by saponification with KOH in alcohol. The precipitate is separated and then heated for identification by odor of the styrene monomer. Shaefer[135] achieves saponification of esters resistant to saponification by using potassium hydroxide, diethylene glycol and phenetole. Jaffe[134] determines the optical density of acetylation products of dipentaerythritol by an infra red technique at 1115 cm. Martin[133] developed a method for determining the methyl alcohol content of phenol alcohol by reaction with a phenol to

form bis (hydroxyphenyl) methane and water. The results are within 3% of calculated value and can be used for ureas and melamines as well as phenolics.

Production Equipment

HEAVY duty paste mixers of 50, 100, and 150 gallon capacity with direct motor drive have been offered by Charles Ross and Son Co. Labor and mixing time are reported to be kept at a minimum. A 1000 gallon, direct motor driven, liquid and semi-paste mixer is also available which can also be used as an agitated storage tank with slight modification in the stirrer arrangement.

Two vertical three roll mills have been made available by J. M. Lehmann Co., Inc., that have the motor mounted on a hinged platform at the top of the machine frame in order to conserve floor space. The extra large hopper is sealed on a bevel at each end of the roll, the hinged motor platform makes for easy adjustment of the Multi-V-Belt drive, and the bearings may be quickly and easily lubricated.

A rectangular mixing tank with a half round bottom of 60 gallon capacity is offered by L. O. Koven Bros., Inc. A steam jacket for heating up to 125 pounds per square inch is included and mixing is achieved by two opposite rotating stainless steel ribbon spiral agitators.

A superior method of dispersing pigments in plasticizers and resins is claimed for a new type of dispenser being offered by the Tri-Homo Corp. who claim it to be an improvement over the conventional colloid mill.

Coors reported on alumina ceramic flattened spheres as a grinding medium for pebble mills and claims a 40% increased output over porcelain balls. T. J. Laird claims a kinetic dispersion mill with one moving part.

IMPORTANT PRODUCTS DEVELOPED DURING 1951

Illustrations used are some of the important equipment developments during 1951.

RESINS

AROCHEM 372 — Modified phenolic, fast bodying. *U. S. Industrial Chemicals Company.*

AROCHEM 547 — Modified condensate; replacement for maleics in lacquers. *U. S. Industrial Chemicals Company.*

AROCHEM 609 — Fast bodying condensate; replacement for modified maleics; used with soft oils. *U. S. Industrial Chemicals Company.*

AROFLAT 3050-P-40 — Non-phthalic, non castor oil, modified alkyd for non-penetrating, for self-priming flat wall finishes. *U. S. Industrial Chemicals Company.*

AROPLAZ 945-X-65 — Recommended for alkyd component of hot spray lacquers; meets MIL-L-11195 (ORD) *U. S. Industrial Chemicals Company.*

AROPLAZ 1313-M-75 — Non-phthalic, non-castor resin of the color-retentive type, for architectural enamels. *U. S. Industrial Chemicals Company.*

AROPLAZ 1366-X-60 — Medium short phenolic modified oxidizing alkyd for aircraft primers MIL-P-6889A, Type I; automotive primers for non-lifting lacquer coats. *U. S. Industrial Chemicals Company.*

AROPLAZ 1388-M-65 — Long oil oxidizing alkyd for ready mixed aluminum paints, excellent stability, leaf retention and durability. *U. S. Industrial Chemicals Company.*

AROPLAZ 1389-M-75 — Non-phthalic long oil, oxidizing resin for ready mixed aluminum paints. *U. S. Industrial Chemicals Company.*

AROPLAZ 1397-M-50 — Fast drying, modified alkyd for use in fast-drying industrial enamels. *U. S. Industrial Chemicals Company.*

AROPOL 866-P-50 — Copolymer styrenated oxidizing alkyd of short medium oil length designed for grind charge of MIL-E-10687 (ORD). *U. S. Industrial Chemicals Company.*

AROPOL 881-X-60 — Styrenated, oxidizing, non-castor alkyd of short oil length for use in fast dry industrial finishes, hammer finishes and specification MIL-E-10687. *U. S. Industrial Chemicals Company.*

B-56-RESIN — Produces a semi-alkyd with drying oils; suggested for primer sealers and flats. *Hercules Powder Company.*

CELLOLYN 106 — Lacquer resin of plasticizing type; intended to replace both the hard resin and oil in lacquer formulations. *Hercules Powder Company.*

CYCOPOL S-202-5 — Non-castor, styrene-alkyd resin; fast drying. *American Cyanamid Company.*

CYCOPOL S-203-5 — Fast drying vehicle; for meeting MIL-E-10687 specification. *American Cyanamid Company.*

DOW LATEX 744-B — Vinyl latex for paper, textile and paint; resistance to moisture, chemicals, grease. *Dow Chemical Company.*

DRESINOL 155 — Non Solvent type, high melting resin dispersions. *Hercules Powder Company.*

DUREZ 240 RESIN — High melting terpene phenolic; useful in modification of alkyd in situ; improved water resistance, pigment wetting and application properties; in surfacers, it improves sanding and holdout properties. *Durez Plastics & Chemicals Inc.*

EPONS 1001, 1004, 1007 and 1009 — Condensed polymers of epichlorohydrin and bisphenol useful in baking and industrial finishes by cold blending of esterfied with drying oils to make varnishes for trade sale use and industrial finishes. *Shell Chemical Company.*

G-E R-108 — Baking type resin, outstanding chemical resistance with flexibility and heat resistance, imparts high resistance to alkalies, acids, oxidizing agents, solvents, salts; use; drums, tank cars, chemical tanks and equipment. *General Electric Company.*

GLYPTAL 2522 — Fast drying, hard, tough alkyd resin with good adhesion gloss and color retention, flexibility, chemical resistance and durability. *General Electric Company.*

GLYPTAL 7300 — Alkyd; general purpose with good gloss retention; for architectural finishes. *General Electric Company.*

GLYPTAL 7305 — General purpose alkyd. *General Electric Company.*

GLYPTAL 7310 — Alkyd; rapid tough baking vehicle for industrial finishes. *General Electric Company.*

GLYPTAL 7315 — Alkyd for low cost industrial finishes and primers. *General Electric Company.*

GLYPTAL 7422 — Short oil alkyd, free of any modifiers; possesses good drying speed; primers conforming to MIL-6889A can be made without the use of phenolic dispersion resins. *General Electric Company.*

KEL-F-N-1 and NW-25 — Dispersions-monochlorotrifluroethylene polymers for insulating coatings. *M. W. Kellogg Company.*

LUSTREX X 700 RESINS — Water soluble modified styrene resins for use in films and as a dispersing agent. *Monsanto Chemical Company.*

PLIOLITE 66A-55 — Monastral blue dispersion; excellent color stability; for chemical resistant coatings. *Chemical Div., Goodyear Tire & Rubber Company.*

New Pittsburgh Plate Glass plant at Torrance, Calif. Left: Solvents delivered by electronic control. Center: Main manufacturing section, Right: View of suspended ball and pebble mills.



PLIOLITE BASE 85-S5 — Pigment-in-resin dispersion, red base type. *Chemical Div., Goodyear Tire & Rubber Company.*

POLYAMIDE "S" RESINS — Based upon standard grader of "Polyamide"; contains small amount of antioxidant which serve as a heat stabilizer; for hot melt application. *General Mills, Inc.*

POLYAMIDE RESIN NO. 90 — Hard, tough and brittle copolymer; good resistance to greases, oils, water, alkalies, mild acids and some solvents. *General Mills, Inc.*

POLYAMIDE RESIN NO. 100S — Soft, tacky plasticizing resin, amber in color and resistant to oils, greases and water, alkalies, and some organic solvents; exhibits exceptional adhesive properties on a wide variety of surfaces. *General Mills, Inc.*

POLYCO 309 — Polyvinyl acetate polymerized in alcohol for use in coating paper. *American Polymer Corp.*

POLYCO 319 — Acrylic copolymer emulsion for coating leather. *American Polymer Corp.*

POLYCO 350N — Butadiene-styrene latex for paper coatings. *American Polymer Corp.*

POLYCOS 422 and 423-NS — Aqueous emulsions of 40% butadiene-acrylic copolymers for leather and paper coatings. *American Polymer Corp.*

POLYCO 437 — 25% solution of polyacrylic acid in water for textile treatment. *American Polymer Corp.*

POLYCO 446 — 45% water emulsion of an internally plasticized polyvinyl chloride copolymer for heat seal coatings, leather coatings and grease resistant coatings. *American Polymer Corp.*

POLYCO 1010-32 — Unplasticized acrylic ester copolymer emulsion of 40% solid for use in leather finishes. *American Polymer Corp.*

POLYCO 1040-14B — Polyvinyl acetate emulsion, 55% solids, grease proof and heat seal coatings. *American Polymer Corp.*

POLYCO 1677-35C and 1677-7C — Unplasticized polyacrylic ester copolymer emulsions of 40% solids for grease proof and heat seal coatings. *American Polymer Corp.*

POLYCRYLS 413, 414, 427, 415, 419, 420 — Series of water white solutions of acrylic copolymers for use with vinyls; preparation of heat resistant white enamels and coatings. *American Polymer Corp.*

POLYMER C-3 — For leather coatings and a thickener. *Shawinigan Products Corp.*

PROTOVAC CASEINS — Series of caseins and modified types for leather, paper and textiles coatings. *Chemical Division, Borden Co.*

RESIN TS 22 — Polyvinyl acetate emulsion for general coatings. *Shawinigan Products Corp.*

RESINOUS ALCOHOLS — Series of products containing esterified rosin and unsaturated fatty acids; for varnish, alkyd, and ester gum production. *General Mills, Inc.*

REZYL 414-1 — Medium oil length soya resin soluble in mineral spirits; fast drying, good color retention, gloss and durability. *American Cyanamid Company.*

RUBBER LATICES — Chemigum 235 and 245 series are addition to line of Chemigum latices of butadiene-acrylonitrile copolymers for coating, impregnating, compounding application; properties include good adhesion, resistance to oils, alcohols and most solvents. *Chemical Div., Goodyear Tire & Rubber Co.*

SILICONE ALKYDS — Chemically combined silicone alkyd; high heat resistance, resistance to weathering and humidity, chemicals and salt-spray. *Plaskon Division, Libbey-Owens-Ford Glass Company.*

SILICONE RESIN 81182 — Wide range of compatibility with other resins; combination with alkyds results in moisture-resistant properties. *General Electric Company.*

STABILIZED PARLON — Stabilized chlorinated rubber; improved heat and light stability; better weathering, and reduction in under-film rusting. *Hercules Powder Co.*

UFORMITE 700 — High wet strength resin for paper coatings. *Rohm & Hass Company.*

VAD-4 — Resin offers new advantages in substrate protection and chemical resistance over metal surfaces. *Velsicol Corp.*

WHEAT PROTEIN — Aqueous dispersion of high concentration; resistance to putrefaction, less tendency to foam; replacement for zein. *General Mills, Inc.*

RESIN INTERMEDIATES

AMBEROL 750 — Rosin ester is useful in formulating wax emulsions; gives excellent leveling and high gloss. *Resinous Products Division, Rohm & Haas Company.*

BLEACHED SHELLAC — Cold process for bleaching shellac resulted in a new product, "Cold-Pro"; has improved color toughness, body, solubility, stability, etc. *Acme Shellac Products Co.*

CAPRYL ALCOHOL — Used as intermediate for vinyl plasticizers, urea-type coating resins; oil soluble additive; antifoaming agent. *Rohm & Haas Company.*

NEO-FAT-D-242 — Low cost quality rosin replacement; D-242 is mixture of rosin acid and valuable fatty acids. *Armour & Company.*

NEO-FAT 3-R — Improved fatty acid with high linoleic content; alkyds made from Neo-Fat 3-R dry harder and faster with outstanding non-yellowing properties. *Armour & Company.*

POLYCO 438 — Extender for polyvinyl acetate; completely compatible with all grades of polyvinyl acetate. *American Polymer Corp.*

RESIN ADDITIVE DP 520 — Compound gives coatings flexibility toughness and stability against humidity changes; wide compatibility. *Drew & Company.*

TBBA — *p*-tertiary butyl benzoic acid; for producing alkyds with improved gloss, hardness, color retention and light stability. *Shell Chemical Company.*

VINYLTOLUENE — Styrene substitute for paints, varnishes, latices and resins. *Dow Chemical Company.*

PLASTICIZERS

ALROMINE R U-100 — Plasticizer for paper coatings. *Alrose Chemical Company.*

ARNEELS — Series of 11 high molecular wt. aliphatic nitriles; plasticizer is used in many cases as primary plasticizer for low temperature flexibility. *Armour & Company.*

BUTYL ACETOXYSTERATE — General plasticizer. *Baker Castor Oil Co.*

FLEXOL R-2H and 2GB — Plasticizer for vinyl chloride resins. *Carbide and Carbon Chemicals Division, Union Carbide & Carbon Corp.*

FLEXRICIN 51 — Wetting agent as well as a plasticizer. *Carbide & Carbon Chemicals Division, Union Carbide & Carbon Corp.*

HERCOFLEX 600 — Non-phthalic primary plasticizer for vinyls; offer excellent stability with low volability. *Hercules Powder Co.*

PLASTICIZER — Triethyl phosphate plasticizer for water base paints. *Tennessee Eastman Company.*

PLASTICIZERS C-311 and 325 — Plasticizer for lacquers and vinyls. *C. P. Hall Company.*

PLASTICIZER P-319 — Plasticizer for nitrocellulose; imparts good flexibility; does not spew at high temperatures; recommended as a replacement for castor oil. *Bonner Chemicals, Inc.*

PLURONICS F68, L44, L62, L64 — Plasticizer, wetting agent. *Wyandotte Chemicals Company.*

MPS-500 — Vinyl plasticizer, low migration, good flexibility, good electrical properties and excellent fire-retardant characteristics. *Hooker Electro-Chemical Company.*

MONSANTO H B-40 — Partially hydrogenated triphenyl, water white; use in clear or tinted vinyl coatings. *Monsanto Chemical Co.*

MONSANTO ONB — Orthonitrobiphenyl is orimary plasticizer compatible with a wide range of materials including cellulose esters, polyvinyls, rosin, modified phenolics, vegetable oils, alkyds; also has fungicidal properties. *Monsanto Chemical Company.*

STABLE FATTY ACID ESTER — Methyl-cyclohexyl stearate; secondary plasticizer and modifying agents for cellulosic coatings; improves water resistance and gloss. *Witco Chemical Company.*

VINYL PLASTICIZER — Monomeric type has good solvent action and compatibility, good light stability; recommended for use with vinyl resins in calendaring, plastisol and organosol coating and dipping. *Deccy Products Company.*

SOLVENTS

BUTYL ETHYL CELLOSOLVE — Lacquer solvent and coupling agent. *Chemical Division, Union Carbide & Carbon Corp.*

BUTYLENE GLYCOL — High boiler, intermediate for production of rosin esters, plasticizers and resins. *Celanese Corp. of America.*

DIGLYCOL DIACETATE — High boiler, slow evaporating for cellulose lacquers. *Chemical Division, Union Carbide & Carbon Corp.*

ETHYLENE GLYCOL DIMETHYL ETHER — Solvent and anti-blush agent for lacquers. *Celanese Corp. of America.*

KETOSOLS — Mixtures of phenyl methyl carbinol and acetophenone; high boiler, high solvency, pleasant odor. *Chemical Division, Union Carbide & Carbon Corp.*

3-METHOXYBUTYL ACETATE — For blush resistance and improving flow of lacquers. *Chemical Division, Union Carbide & Carbon Corp.*

SOLUIDENE — Mixture of paraffins, naphthenes and aromatics. *Colonial Alloys Company.*

SOLVENT 62 — Mixture of methanol, ester, aldehydes and acetates; acts as a solvent and coupling agent. *Chemicals Dept., Quaker Oats Co.*

OILS

DIMER ACID 955 — Dibasic acid, viscous type; has excellent heat stability; polyfunctional allows polymerization; forms both soluble and insoluble soaps; acts as a bodying agent and replacement for drying oils. *Emery Industries Inc.*

FALKWOOD OIL — Series of treated oils for replacement of wood oil. *Falk & Company.*

LECTUNG OIL — Reinforcing oil for mixed paints, fillers, concrete, stucco, shingle stains, etc. *H. B. Davis Company.*

TALL OIL — Ardex PE is improved type of tall oil; lighter color, improved film properties and greater uniformity; esterified with pentaerythritol. *Archer-Daniels-Midland Company.*

STABILIZERS

ACRYLIC POLYMERS — Modified sodium polyacrylates are water soluble anionic colloids; used as stabilizers, thickening, suspending agents; also has film forming properties. *Industrial Chemicals Division, American Cyanamid Company.*

ANTIOXIDANT — "WING-STAY" is an amber liquid consisting of a blend of substituted phenolics; soluble in solvent; insoluble in water, used as a stabilizer in paints, wax emulsions, resins, polymer solutions and polymer-wax combinations. *Chemical Div., Goodyear Tire & Rubber Company.*

BARINAC — Vinyl stabilizer, barium ricinoleate. *National Lead Co.*

CASCOLA, CASCOLAC, PROTOVAC — Stabilizer for latex paints; use eliminates heating and mixing operation, storage problems, improved resistance to freezing, etc. *Chemical Division, Borden Co.*

COMPOUNDS — Calcium ricinoleate for use as a grinding aid and stabilizer for vinyls; magnesium ricinoleate for use as thickening agent and flating agent; Paricin 51 — plasticizer in lacquers; Solricin 2 for use as an anticorrosive agent and emulsifier; PC-1 WW manufacture of alkyd's. *Baker Castor Oil Company.*

DUTCH BOY CS-137 — Stabilizer for vinyls; will not stain when in contact with sulfur; imparts good light stability to vinyls. *National Lead Company.*

EXKIN 1 AND 2 — Anti-skinning agents; inhibits skinning with minimum drying interference, odorless, non-toxic. *Nuodex Products Co.*

MONSANTO AE-1 — High molecular weight alcohol ester; used as a defoamer in polystyrene latex water emulsions, coplasticizer for chlorinated rubber, dispersing agent. *Monsanto Chemical Co.*

RAYBO 3 — Anti-silking and anti-flooding agent for colored enamels. *Raybo Chemical Company.*

STABELAN G-1 — Vinyl stabilizer in paste form; for coatings, organosol and plastisol dispersions; improve resistance of vinyls against heat and light. *Standard Chemical Company.*

SURFACE ACTIVE AGENT — "R & R 551 INTERFACE MODIFIER" is colloidal surface active agent with good pigment dispersing properties in latex paints; reduces foaming. *Ross & Rowe, Inc.*

THICKENING AGENT — "Bentone" 18 provides maximum gelling efficiency in mixtures of polar and non-polar solvents; recommended for paint, varnishes, adhesives, etc. *National Lead Company.*

ULTRAWETS — Water soluble surface active agents; anionic in nature; ultrawet is recommended in water emulsion paints because of low salt content. *Atlantic Refining Co., Chemical Products Div.*

WITCO LEAD STEARATE NO. 50 — High lead content primary heat stabilizer and internal lubricant for polyvinyl chloride resins. *Witco Chemical Company.*

YELKIN XTS — Surface active agent for latex emulsion paints. *Ross & Rowe Inc.*

PIGMENTS AND EXTENDERS

ASP-100 — Fine particle size plate-like crystal aluminum silicate inert of very high whiteness. *Edgar Brothers Company.*

CHROMATES — Calcium, lithium magnesium, sodium, and zinc chromate are rust inhibitive pigments. *Mutual Chemical Co. of America.*

CHROME GREEN — Line of chrome greens with improved light fasteners; has better resistance to darkening and outdoor exposure. *Pigments Dept. Du Pont Company.*

GARETEX GP — Finely divided siliceous material consisting of 85% silica and 15% ground glass; high resistance to abrasion and freedom from settling. *Garco Products Inc.*

GREEN-GOLD — Green Gold YT-562-D has excellent light fastness, will not fade when extended to very pale tints; has good baking properties. *Pigment Dept., Du Pont Company.*

ITALIAN BENTONITE — White colloidal clay used as an emulsifying, spreading, suspending, thickening, plasticizing, and sizing agent. *Whittaker, Clark & Daniels, Inc.*

LEAD CYANAMIDE — Anti-rust pigment with a lead base; low specific gravity, non-settling, suitable as a basic or top coat. *Berkshire Chemicals, Inc.*

MAROON GOLDS — Maroon Gold RT-GO8-D (yellow shade), Maroon Gold RT 665-D (blue shade). Non-bleeding suitable for automotive finishes; light fast in lacquer and alkyds; tolerate large amounts of non-leafing aluminum. *Pigment Dept., Du Pont Company.*

PURECAL M — White extender which contributes some hiding power and more than 10% of titanium dioxide may be replaced with no less in hiding or whiteness. *Wyandotte Chemical Corp.*

SILICA ACQUASOL — Basic silica micelle of Syton C-30 possesses a weak negative charge; material lends excellent skid resistance and high gloss to aqueous waxes; aids suspension of pigments in aqueous systems. *Monsanto Chemical Company.*

MISCELLANEOUS

ALKYLAMINES — Series of refined and technical grades of tertiary alkyl amines; uses include surface active agents, improving solubility, corrosion inhibitors, insecticides, wetting agents, stabilizers, antioxidant, etc. *Rohm & Haas Company.*

AQUARESIN — Glycol Bori-Borate is an odorless, viscous, colorless non-drying, hygroscopic liquid; valuable in water, methyl alcohol, glycerine and glycols; insoluble in oils and hydrocarbons; used as a softener and plasticizer for glue and water soluble gums. *Glyco Products Company, Inc.*

CONCORD 407 — Carnauba replacement; gives highly stable emulsions that are transluscent, light in color with good gloss and durability. *Concord Chemical Company.*

DEFOAMER E D — Use in rubber latex, water emulsions paints. *El Dorado Oil Works.*

EMERSOL STEARIC ACIDS — Fine powder stearic acids fascilitates grinding of metallic pigments and powders; gives excellent leafing characteristics to bronze and aluminum powder. *Emery Industries, Inc.*

EMERY C-842-R STERONE — Wax extender, insoluble in water, slightly soluble in hot alcohol or ether. *Emery Industries, Inc.*

INSECTICIDE — Dichlorodiphenyl dichloroethane is recommended for mixing paint before application; may be used in oil, water and cement paints. *Dianol Sales Corp.*

QUICK SET ACCELERATOR — For hardening resins at room temperature. *Resolin, Inc.*

WITALL DRIERS — Tallate type drier line. *Witco Chemical Co.*

PRODUCTION EQUIPMENT

AGITATOR — For heavy pigmented materials; hand or power operated. *American Pulley Company.*

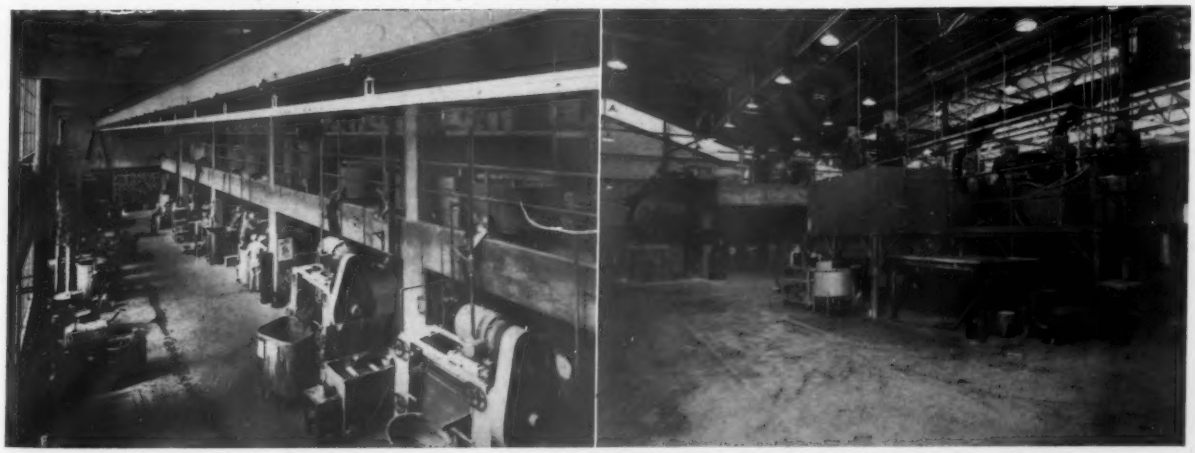
AGITATOR — Slow speed type; adaptable in areas where there is low head room. *International Engineering Co., Inc.*

CAPACITY MIXER — Mixer for paint manufacturers; capacities 400-1200 gallons; specially designed agitators and scrapers; custom made. *Lloyd Engineering Company.*

CAPPER — Automatic; for manual loading of cans, caps and bands; handles sizes from 1 pint to 2 gallons. *Upressit Products Corp.*

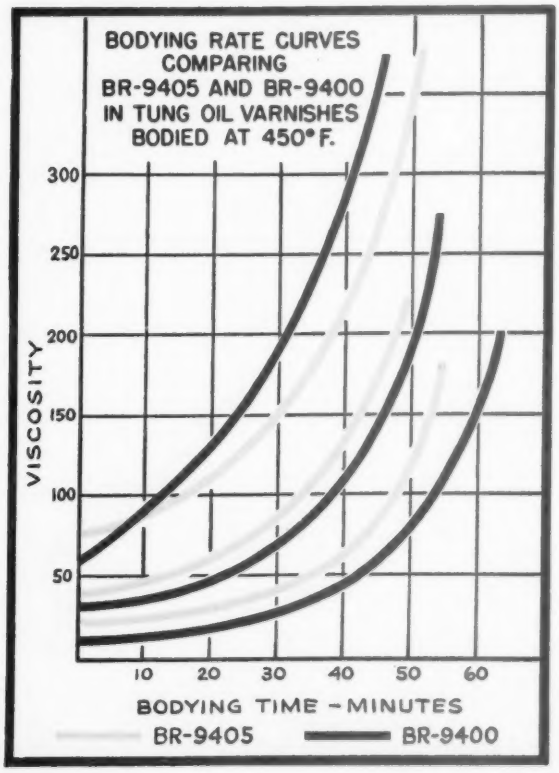
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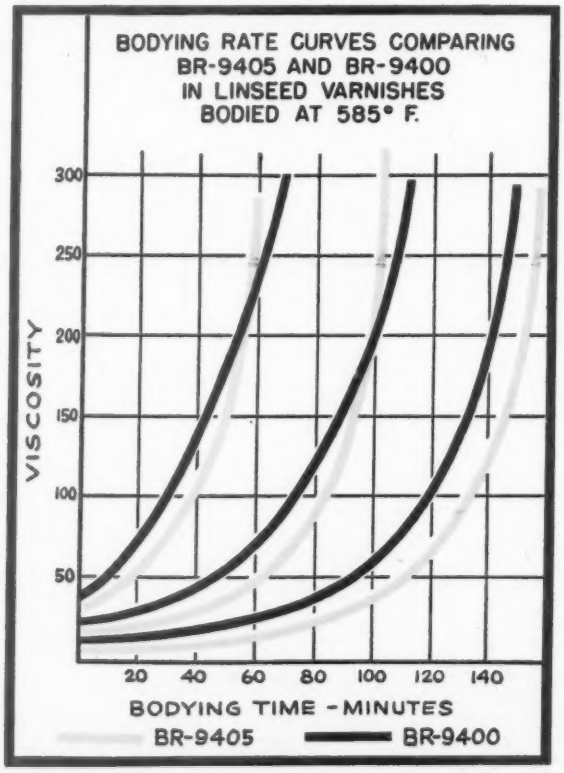
General Paint Company's modern Los Angeles plant features effective positioning of equipment, maximum use of piping for liquids, and arrangements for minimum hauling of materials.



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NON-HEAT-REACTIVE, OIL-SOLUBLE





BR-9405 is the first of a new series of BAKELITE 100% Phenolic Resins. It was developed to help you increase production and maintain quality in current formulations and to produce new coatings to expand your markets.

BR-9405 has many properties comparable or superior to those of existing phenolic resins—properties formerly obtained by combining two or more of these resins. You will want to investigate these features:

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- Does not require high temperatures for processing.
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- Excellent tolerance for low strength hydrocarbon solvents.
- Used with low-cost rosins and rosin esters, it produces economical, fast-drying varnishes having excellent film properties.
- Insures production of fast-drying vehicles having high kauri reduction values.

FIRST OF A NEW SERIES OF BAKELITE 100% PHENOLIC RESINS

TRADE-MARK

BR-9405 PROPERTIES

Physical Characteristics	Solid lump resin		
Softening Point (WC-71-B) . . .	265-295°F.		
Specific Gravity (WC-1-A) . . .	1.03-1.06		
Color (1:1 toluol WC-5-0)	Not darker than 13 (Gardner 1933)		
Resin Solubility	Aromatic and most aliphatic solvents, as well as ketones and esters		
Drying Rates (25-gallon oil length)	Tung Oil	Linseed Oil	D.C.O.
Air Dry (to handle)	3 hr.	12 hr.	12 hr.
Bake at 275°F.	20 min.	40 min.	40 min.

BR-9405 matches certain properties of two other well-known BAKELITE Phenolic Resins, BR-254 and BR-9400, such as:

- cooking speed
- drying time
- gas-proofing
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- water and chemical resistance

Our sales representatives are ready to serve you in working out new applications of BR-9405 or in applying the resin to increase production of your present line of coatings.

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TIME was, when paint was al nost wholly a *local* business.

Paint could not be shipped—had to be mixed on the job—for there wasn't a can in existence that could be resealed after opening.

But as the development of the industry brought hundreds of new products—paints, oils, thinners, waxes, lacquers, and special finishes—Canco worked hand-in-hand with paint manufacturers, developing containers to protect these products from plant to job.

The important thing about these containers is their perfect adaptability. The turpentine can, for instance—handy in shape, won't drip, tight closing—with a flat surface for brand label.

For more than fifty years, American Can Company has worked with the paint industry. In these critical times, Canco's accumulated knowledge and resourcefulness will continue to help its customers meet the unusual problems brought about by the national emergency.

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PART III

DETAILED RESEARCH TECHNICS

By
HOWARD C. WOODRUFF
Alkyd Products Engineering
General Electric Co.

IN the coating Materials Industry, from the Research standpoint, we have become aware that the surface coatings we work with are best regarded as structures. The ingredients of surface coatings are the parts of the structure, each one of which has a relationship to the total characteristics of the finished product.

Consider the construction of another engineering product — a bridge. The construction of a bridge is similar in many aspects to the construction of a surface coating. The bridge is a combination of steel beams, rivets, bolts, concrete footings, cables and roadway. It is the steel structure. The steel used to make it could have been used to make many other things — it could have formed the framework of a building, the interior of a ship, or the outside of a power generator. But as a collection of individual parts, however strong or accurately machined, simple parts do not make a bridge. The bridge only exists when the parts are assembled so that each part has a function and a relationship to every other part. This means that an engineering structure consists of parts and relationships which give form and use to the bridge structure.

Research is like a jig saw puzzle. We have to find the pieces, fit them together and see what picture they make. New approaches in Research are based on the jig-saw pattern of working. Let us discuss it in Part III of this series.

Our surface coating products, our finished Paints, Varnishes, Lacquers, Sealers, etc. are likewise engineering structures. A surface coating consists of parts such as Pigments, Inerts, Resins, Oils, Driers, Thinners. But these unassembled raw materials do not make up the surface coating any more than unassembled steel and concrete makes up a bridge. In the surface coating each part has a definite place and function. We recognize that alterations in each part and each function effect the ultimate character and performance of the coating.

Before a bridge is assembled, engineers can and do calculate the stress and strain on each member. They also have information on the ability of each member to withstand such stress and strains as will be applied in use. In this manner each part is assembled as a result of known data — each part being designed as the result of available information as to its function, its relation to every other part, its relation to the bridge as a unit.

Editor's Note — Including suggestions on methods of working and methods of organization for both laboratory chemist and executive, Mr. Woodruff writes these discussions based on his own varied experiences. The facts and examples he uses do not necessarily represent the practices of any single company.

In the coating materials industry the information now available to us about the parts of our surface coating structures is not yet subject to so precise an engineering description as the parts of a bridge—neither are our problems so clear cut as the problems engineers have in bridge design. We cannot yet isolate and measure each variable of each structural part. But the direction being taken by our research today is aimed at isolating the individual parts of our systems of coating materials, measuring them, and determining how variations effect the properties of the coating.

Our new research outlook attempts to put our information into a consolidated structure picture, place the picture in proper perspective compared with other structure-pictures, both existing and possible-to-exist.

Being aware that the substances we work with have parts and that they are parts of a structure, the step by step operation of a research project falls into an order somewhat as follows:

1. Select a limited field for investigation
2. Segregate, isolate, measure and describe the parts of the substance involved
3. Determine the functions of each part
4. Show what effects result in the substance involved when one part of it is varied (determine cause-effect relationship)
5. Show what effects result in the substance when a second part is varied.
6. Predict an effect that will occur when still another part is varied.
7. Check the prediction experimentally
8. Continue to determine and predict cause-effect relationships
9. Develop enough cause-effect data, correlate the cause—effect data into a pattern so that any characteristic of the substance or any question regarding it can be answered in terms of cause-effect relationship.

Explanation of a field includes: a. Itemization of the parts, b. Description of the parts, c. Description of the function of the parts, and d. Demonstration of interrelation between variation in the parts and resultant variation in the whole.

Limitations of Resources

KEEPING before us the consideration that our information consists of structures within structures and structures beyond structures, we can see at once that research can be without limit. But we cannot do research work without limit, and we would be without intelligence if we recommended doing it. In looking at any broad research field we quickly see the application of the proverb "don't put too many irons in the fire."

Here our Research-Development Team starts to operate. In Industry it is definitely up to the Development group to point out where research is needed. In many cases the Development man may be on the Research Team or does the development man do the Research work himself? It all depends on your business organization or size.

In practice we do decide where we are going to do our research work and where we shall set its boundaries. With this decision made, we make a trial-balance of our information versus non-information and try to get a birds-eye view of the structure we are going to work in. We can then tell if we have a midnight black pinpointed with a few sparks of information, or if we have a network of lights with a few defective connections. At this point we know how big our job is.

An idea of this phase and the phases that follow it are given in Chart I.

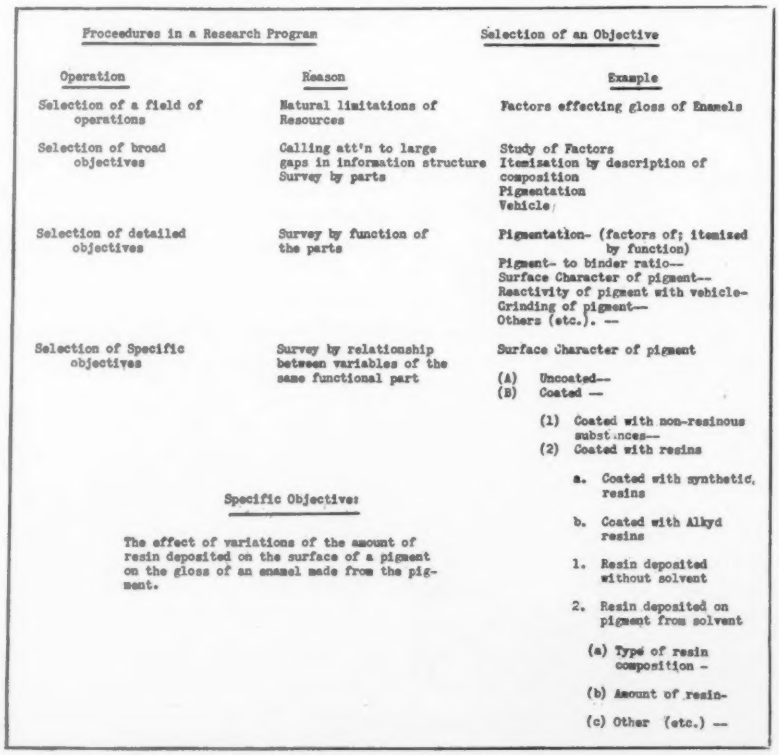
As an example, a research group in a paint plant might set out to study Gloss Enamels. This example is considered in the last column in the chart.

Broad Objectives — Having a birds-eye view of structure in our field of research we can see where the large gaps in our information is lacking. We can see here our structure needs: (1) parts that have never been put in, (2) replacement of parts that are defective (3) more details about a part or relationship.

At this stage we begin to get an outline of a cause-effect information that will be necessary for us if we want to explain a structure. Also we know what parts of our structure require further attention. Note that at this point we have

Chart I

Trial balance of information vs. non-information.



itemized our factors (c.f. 2 above) by description. We have surveyed our structure according to its parts.

Detailed Objectives — Now we are in a position to take one of the factors, itemized as a "part" and further classify it into factors itemized by "function". Evolving full information about each function then becomes a detailed objective since it is small enough in scope to receive concentrated attention. In the example in Chart I we have itemized the functional factors of pigment into (a) pigment-to-binder ratio, (b) surface character of pigment, (c) reactivity of pigment with vehicle, and (d) others which may or may not be named. This is the place in the survey of structure where we consider the functions of the part. From this list we can select a specific objective.

The Specific Objective — This is the smallest point in our survey of structure. It is concerned with relationship between variables in the same function part.

In the example, the function of "Surface Character of Pigment" is further surveyed into various possible cause-effect relationships. From the survey shown we elect to study the cause-effect relationship: the effect of variations in the amount of resin on the surface of Pigment (Q) coated with various amounts of resin (R) on the gloss of enamels Z made from the pigments P. (Q,R, and Z indicate the same starting materials).

The next problem — how to attain our stated objective and be able to express a cause-effect relationship.

> Don't let the apparent simplicity of this statement be misleading. The variables within the same function can be terrific in number while the number of functions can be up in the hundreds of thousands even in the rather straightforward system we are discussing here. These variables do not show up to do us great harm today unless we purposely cause accentuation of them — and we try to do this to our advantage. But the statisticians try to consider all of them and that is why statistics has not gone very far yet in the Paint Industry. But those variables, when we cause them and understand them are the real stepping stones in our forward progress. Little stones make big buildings.

I Experiment No.	II Standard	III Variation (wt. of alkyd resin on pigment)	IV % Resin on wt. of pigment	V Gloss of enamel	VI Deviation of gloss from standard
Control	Enamel	None	None	80.00%	0.00
1	varied	.75 parts	1.00	87.90%	+7.90
2	"	.25 "	0.33	85.70%	+5.70
3	"	1.50 "	2.00	88.00%	+8.00
4	"	.50 "	0.66	87.15%	+7.10

Table I
Results of experiments carried out in steps.

Attaining Specific Objectives By Experimentation

TO determine our cause-effect relationship we resort to using the primary tool of research — Experimentation.

Translating the example we are considering into the experimental, our technic becomes:

A. Formulation of a standard enamel: Production of the same enamel a number of times (to assure that it can be made up at will). The Standard Enamel contains the standard pigment not coated with the resin
   (a) This procedure is the "establishment of standard conditions".

B. Testing the enamel: for gloss value as the main property, but also for viscosity, drying, flow, stability, settling, brushability, adhesion, flexibility and tensile strength. Test methods of known sensitivity and known reproducability.
   (a) This procedure is "establishment of measuring technics suitable for measuring variations of properties of the test materials from the standard".

C. Preparation of a standard enamel, but containing a pigment coated with a known amount of resin (Test enamel No. 1):
   (a) This procedure is — "causing a variation in the standard"

D. Measuring the gloss of the Test Enamel: and also the viscosity, drying, flow, etc.
   (a) This procedure is — "measuring the effect of the variable".

E. Reporting: As a result of our experiment we can have the results as shown in Table I.

This data summarizes our first experimental step. We have this far

Table II
Arrangements of data bearing a definite relationship.

I Experiment No.	II Standard	III Variation (wt. of alkyd resin on pigment)	IV % Resin on wt. of pigment	V Gloss of enamel	VI Deviation of gloss from standard
Control	Enamel	None	None	80.00%	0.00
2	"	.25 parts	.33	85.70%	+5.70
4	"	.50 "	.66	87.15%	+7.15
1	"	.75 "	1.00	87.90%	+7.90
3	"	1.50 "	2.00	88.00%	+8.00

Standard Conditions (Constants)	Series of varied Conditions	Reduced Pigment to-binder Ratio	Standard Pigment- to Binder Ratio	Increased Pigment -to-Binder Ratio	
Pigment-resin reactivity Resin solubility in vehicle	Amount of resin on pigment R_1 resin non-reactive with pigment	Gloss increases as amount of resin increases $R_1 1\% \rightarrow g + 11.2$	Gloss increases as amount of resin increases $R_1 1\% \rightarrow g + 7.9$	Gloss increase as amount of resin increases etc. $R_1 1\% \rightarrow g + 3.1$	etc.
Pigment-Resin Reactivity Amount of resin on pigment	Solubility of resin in Vehicle R_2 resin more soluble in vehicle	Gloss increases as insolubility of resin increases $R_1 1\% \rightarrow g + 11.2$ $R_2 1\% \rightarrow g + 13.3$	Gloss increases as insolubility of resin increases $R_1 1\% \rightarrow g + 7.9$ $R_2 1\% \rightarrow g + 9.1$	Gloss increase as amount of resin increases $R_1 1\% \rightarrow g + 3.1$ $R_2 1\% \rightarrow g + 4.2$	etc.
Resin Solubility in Vehicle Amount of resin on pigment	Pigment-Resin Reactivity R_3 resin more reactive with pigment than R_1	Gloss decreases as reactivity of resin increases $R_1 1\% \rightarrow g + 11.2$ $R_3 1\% \rightarrow g + 3.1$	Gloss decreases as reactivity of resin increases $R_1 1\% \rightarrow g + 7.9$ $R_3 1\% \rightarrow g + 1.0$	Gloss decreases as amount of resin decreases $R_1 1\% \rightarrow g + 3.1$ $R_3 1\% \rightarrow g + 0.9$	etc.
Abbreviations: R- resin deposited on pigment g- difference between gloss reading of control enamel without resin and reading of test enamel using the resin as specified. → indicates "gives the result".		etc.	etc.	Note The positional borders are continued in dotted lines to indicate the structure shown herein is but part of a continuing larger structure	

Chart II

Structural arrangement of variables in pigment-vehicle system. Pigment precoated with resin deposited from solvent, dried before making enamel.

carried out our experiments in the steps as shown in Table I.

This is a description of the experiment we did —

A statement of conditions — The enamel formulation.

A statement of controls — The tests on the enamel.

Two items of data — original test results, and test results on altered enamel.

One item of alteration — a cause (the amount of resin on the pigment).

One item of deviation from standard — an effect (the amount of deviation from the standard).

The data obtained is discussed under the following heads:

Conditions

Enamel: vehicle 100 parts (standard vehicle V), pigment 75 parts (standard pigment Q), grinding 18 hrs., fineness of grind 6.

Control

Test Results: viscosity — 400 centipoises, Gloss — 80% (average of 10 measurements), Drying Time — 2½ hrs., etc.

Variation

Test Enamel No. 1: vehicle — 100 parts, pigment — 75 parts (pigment coated with .75 parts Alkyd resin. 0.75 parts deposited on the pigment from xylol, grind 18 hrs., fineness 6.

Effect of Variation

Test Results: Viscosity — 400 centipoises, Gloss — 88% (average of 10 measurements), Drying Time — 2½ hrs., etc.

The above data comprises the results of a single experiment. We need to make more variations and determine the effect of them. When this is done our experimental results are then available as follows:

1. Establishing standard conditions that can be duplicated at will.
2. Establishing measurements to measure that the standard condition has been achieved and capable of measuring deviations therefrom.
3. Causing a variation in one of the conditions. The variation being purposeful, known, controlled.
4. Measuring the effect caused by the variation.
5. Reporting the deviation.

The experimental phase of research problems can be reduced to the above procedure.

Now we are ready to use the second tool of research — Graphic expression.

Graphic Expression

GRAPHIC expression of relationship requires a number of items of variance and results of observations on the materials in which the variances were caused. More than one variance and observation of the result caused by it is necessary.

First we arrange the variances caused in order of size. Next we arrange the effects alongside the corresponding variance. If the variable resulted in an effect that we succeeded in measuring, an orderly arrangement of result data will appear, corresponding to the arrangement of the variances. If variations in the variable did not result in the effect an orderly arrangement of result data will not appear.

Referring again to our experimental data we rearrange it as shown in Table II.

The numbers in columns III and V bear a definite relationship to one another. We can see that as the resin is deposited on the pigment the gloss increases, the gloss of the enamel increases. The first 0.33 percent resin increases the gloss 5.7 points, the third 0.33 percent resin increases the gloss only .75 parts and further increases of resin (within the range we have data about) does not greatly increase the gloss.

Our table of arranged results is a numerical form of a relationship that can be expressed by a line in the graph shown as graph A.

The graph tells us at a glance what gloss we have observed corresponding to each modification of the standard.

Making Predictions

THE GRAPH can tell us another thing besides what we have observed; it can tell us what we should be able to observe.

It then becomes an instrument for prediction. In order to check the accuracy of a prediction we selected a variation, make a prediction of the result that will occur when the variation is applied, then we apply the variation and measure the result of it.

Our graph tells us that when we add 0.5 parts of resin on to the pigment and make the enamel from it we should get a gloss reading of 86.6%. On making the enamel in the laboratory and reading the gloss on it we found an average of 86.5% for ten readings. This adds confirmation to our observation methods and confirmation to the

accuracy of our original variation series.

The graphic expression gives us a relationship and a direction.

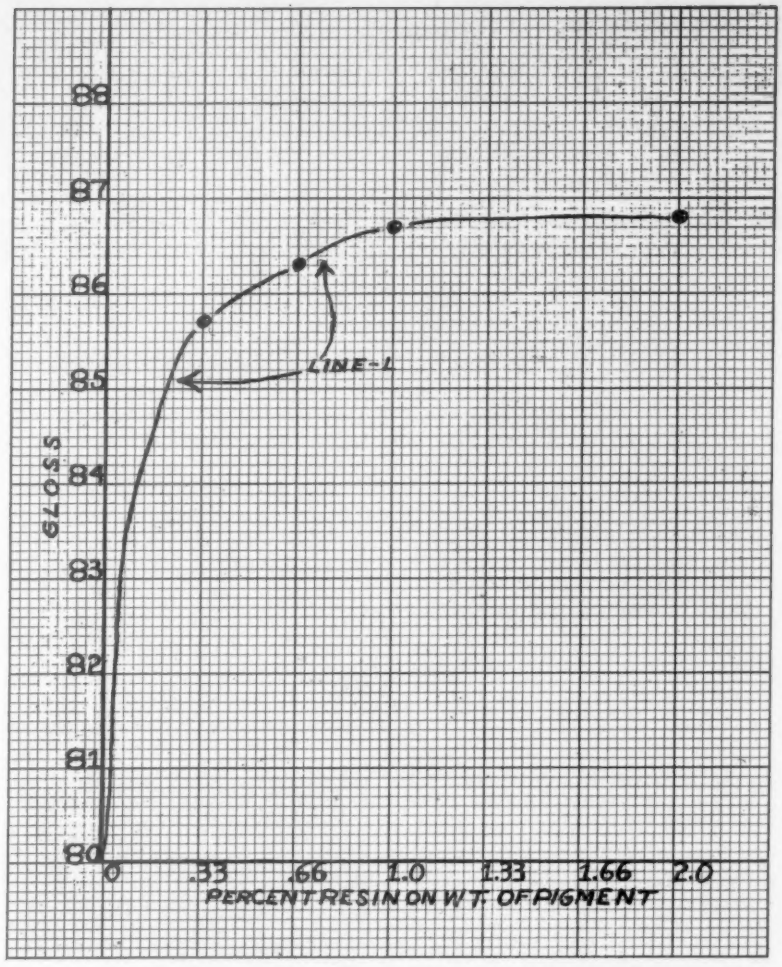
A Conclusion on our specific objective then becomes:

"As the amounts of synthetic alkyd resin (R) deposited on the pigment (p) in a standard enamel (Z) are increased, in the range from 0 to 2.0% resin, the gloss is increased. ½% resin on the pigment increasing the gloss from 80 to 86.6, 1% resin from 80 to 87.9; 2% resin from 80 to 88.0. The relationship is shown by the line L in the accompanying graph."

The graphic expression thus gives us a relationship, a direction, a tool for prediction, but it is a tool of limited scope. In our example it is limited to detailed specific information about one phase of pigment-resin relationships in enamels, and forms one definite starting point toward building our structure of information.

Other questions that we could ask, and answer by the experimental technics as outlined above are:

1. What happens to the gloss when the solubility of the resin in the vehicle varies.
2. What happens when the pigment is reactive with the pigment coating resin?
3. What happens to the effect of the resin as the pigment to binder ratio decreases?



Graph A
Graphic expression of variation in gloss with percent resin.

Chart of Structure

IN THE course of a systematic investigation we evolve the answers to these additional relationships and step by step accumulate a series of relationship data. When we group our relationship statements we begin to see a chart of structure evolving.

Data about relationships can be effectively compared by entering them into a checkerboard type of chart, the research man working like an explorer who records his observations of the size and location of coastline, mountains, rivers, forests, lakes, etc., on a latitude and longitude chart. When we develop our data sequentially and enter the relationships into the checkerboard, we have a chart or structure of the subject.

To an explorer the map reports in a concise form the results of his many observations and relationships between them; to the research man the structural chart of data represents in a concise way the summary of his results and relationships between them.

Characteristics of Structural Data—Structural operations are never complete — the structure we have is always part of some larger structure — but by working from structure we are well aware of the next steps forward—Structural data is always sequential—one step leading to the next step and to the next staircase. As each step is taken many more appear that can be taken.

Structural operations are abstract —being two steps removed from experimentation—they attain only the breadth and precision of the factual and experimental data on which they are founded. A structure without a foundation in incontrovertable facts is worse than useless. Use a structure with care as you use a bridge with care depending on its strength, size, foundation, record of previous use.

Structures are most accurate when they take a form most nearly like the form of the facts they represent.

The Structure of information can and is being extended by continued experimentation, prediction, and verification.

Our Example of Structure—Chart II refers to our example on the study of "Gloss Enamels" and points out how the variable relationships form themselves into a structure of information.

How to Plan Research—Although

(*Turn to page 50*)

NEW PRODUCTS & IMPROVEMENTS

A MONTHLY MARKET SURVEY



CENTRAL

SAFETY VALVE

For 50-Gal. Drums

"Ventadrum" is a new safety valve designed to effectively control and eliminate dangerous explosions caused by pressure expansions in 50 gallon metal drums.

Easily screwed into the bung opening of a universal type 50 gallon drum, this valve is one of the first such units to automatically function under 6 principles.

1. It permits air to enter the drum on contraction of liquid or while liquid is being extracted, eliminating the present practice of leaving an opening at the bung of the container, which sometimes results in failure to replace bung cap.

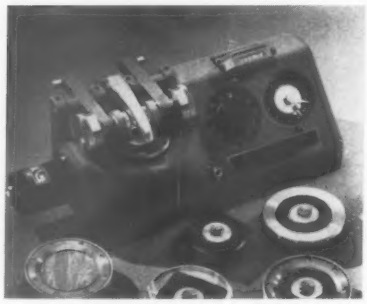
2. It permits air to escape slowly during the expansion of liquid caused by normal temperature changes.

3. It relieves excess pressure rapidly in the event container becomes involved in fire or a quick temperature change, causing liquids to build-up vapor pressure. The Ventadrum valve opens jetting the vapors outward through 6 vents.

4. Ventadrum automatically reseats and shuts off vapor flow when pressure has been relieved.

5. Integral fire screens prevent fire from traveling into drum.

6. In the event container turns over, Ventadrum automatically seals itself, closing-off all flow of liquid and vapor. Further information and descriptive literature may be had by writing to the Central Safety Equipment Co., 2201 E. Huntingdon St., Philadelphia 25, Pa. PVP—January.

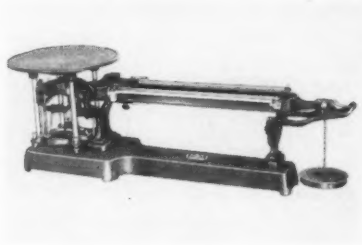


TABER

ABRASER

New Model

Taber Abraser, Model 140, is a test instrument designed to evaluate the resistance of surfaces to rubbing abrasion. Its range of application include tests of painted, lacquered, electroplated surfaces, plastic coated materials, rubber, linoleum, etc. It is designed to meet exacting test requirements. An important feature of this Abraser is that the wheels traverse a complete 360 degree circle revealing abrasion resistance on the same specimen at all angles relative to weave or grain direction. Taber Instrument Corp., 111 Goundry St., North Tonawanda, N. Y. PVP—January.



OHAUS

HEAVY DUTY BALANCE

With Self Aligning Bearings

Incorporation of self-aligning bearings in heavy duty solution balances improves the sensitivity by reducing friction and increase the life of the balance by assuring full contact with the knife edges at all times, according to the manufacturer. Sensitivity of one gram under loads up to its capacity of 20 kilograms is realized. Other features include precision hardened toll steel knife edges throughout, heavy cast-iron base, and rigid cast-iron beam. Ohaus Scale Corp., 1050 Commerce Ave., Union, N. J. PVP—January.

SYNTHETIC RESIN

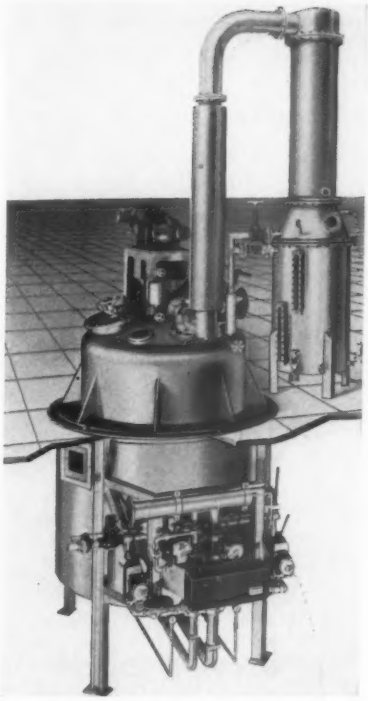
Ketone Base

K-1717 is a non-heat set, neutral synthetic resin designed for solvent type finishes, specifically for vinyl coatings and aniline inks.

This resin is compatible with a number of film formers. Its strong adhesive properties, good alkali resistance and insolubility in petroleum thinners permit formulation of finishes that are highly resistant to naphtha and gasoline.

The combined properties of good compatibility and adhesive strength suggest the addition of K-1717 to copolymer of vinyl chloride-acetate films for direct application on butyral primer wash coats. For further information write to Krumbhaar Chemicals, Inc., South Kearny, N.J. PVP—January.

NEW PRODUCTS



BRIGHTON

RESIN KETTLE
Stainless Steel

1000-gallon synthetic resin kettle features two important advantages in economy. Its low initial cost makes it an economical investment while its special design effects many economies in operation, according to the manufacturer.

The kettle is built of stainless steel for operation under vacuum, or pressures up to 40 p.s.i. Furnace has all safety features. Burners shut off automatically upon failure of pilot flame, gas, or electricity. Special features of the new Brighton Kettle include: 1. Push-button automatic pilot flame ignition; 2. Push-button control that admits cooling air to temperature-control when burners are shut off; 3. Jacketed cylinder inside kettle for cooling contents; 4. Signal lights that indicate every stage of burner operation; 5. High-sensitivity electronic controller that indicates as well as records; 6. Choice of two-speed or variable-speed agitator drive. Brighton Copper Works, Inc., 820 State Ave., Cincinnati 4, Ohio. PVP—January.

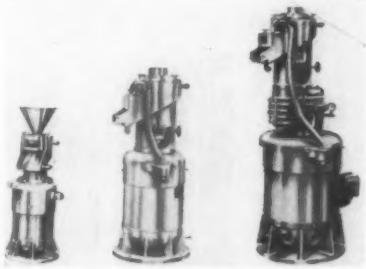
HIGH SPEED MILLS
Improved Designs

Improvement in design and operating features of models M, B-1400, and B-2000 high speed vertical stone milling equipment have been made.

The improvements are important from the viewpoint of capacity. The laboratory or small batch 3-H.P. Model M has a plant-proven capacity of up to 160 gallons per 8-hour day. The 20-H.P. Model B-1400 has a plant proven capacity of up to 3500 gallons per 8-hour day, and the 40-H.P. Model B-2000 has a plant-proven capacity of up to 9000 gallons per 8-hour day.

Care has been taken to make it easy for the operator to control end-product quality and volume on the Model B-1400 and the Model B-2000. An externally hand-wheel controlled micrometer adjusting device permits the rotor stone to be raised or lowered. One full turn of the hand wheel causes only 1/1000 of an inch difference in the rotor stone elevation.

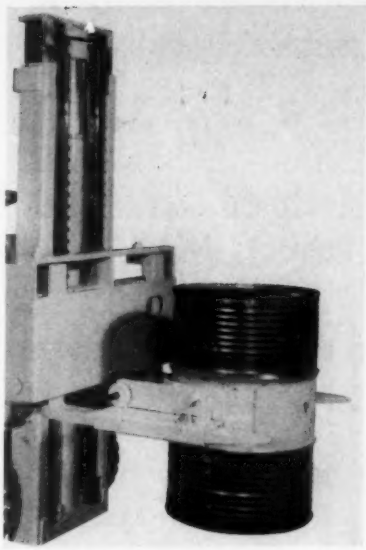
The Carborundum Company, in collaboration with Morehouse Industries, has successfully developed several types of rotor and stator stones for the manufacture of practically all types of paints and enamels, from water-thin viscosity to heavy paste materials. Morehouse Industries, 1156 San Fernando Rd., Los Angeles 65, Calif.—PVP-January.



MOREHOUSE

PLASTICIZER
Castor Oil Derivative

Propylene glycol monricinoleate marketed under the trade name Flexricin 9 (modified type, Flexricin 10) are high molecular esters have application as plasticizers for synthetic resins and as surface active agents. Baker Castor Oil Co., 120 Broadway, New York, N. Y. PVP—January.



BAKER-RAULANG

DRUM CLAMP
Improved Type

Improved version of the drum clamp for fork trucks features retaining springs on the clamp's rubber-faced grab plates. These springs keep leading edges of the plates out of the way while drums are being positioned in the clamp. As the drum moves into position, grab plates close around it to provide fast, safe handling.

Two shoes slip over and are pinned to the truck forks. Curved, rubber-faced grab plates are welded to the shoes. By adjusting the distance between the truck's forks, using the fork-spacing feature of the Baker 4-Purpose Carriage, truck operators can use the clamp attachment to handle drums of any standard size. The Baker-Raulang Co., 1250 W. 80th St., Cleveland 2, Ohio. PVP—January.

RESIN MONOMER
For Copolymerization

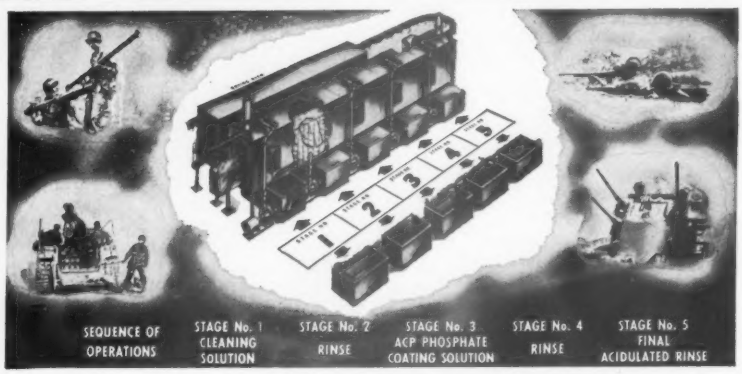
Presently produced in pilot plant quantities a new monomer triallyl cyanurate, is now available for evaluation. Since the new product is compatible with many other monomers and with alkyd resins, it was noted that copolymerizations are readily carried out. The use of such polymers is recommended in applications requiring heat and chemical resistance. American Cyanamid Co., 30 Rockefeller Plaza, New York, N. Y. PVP—January.

AMERICAN CHEMICAL PAINT COMPANY

AMBLER CHEMICALS ACP PROCESSES PENNA.

Technical Service Data Sheet

Subject: METAL PRESERVATION AND PAINT PROTECTION WITH ACP PHOSPHATE COATING CHEMICALS



U.S. ARMY PHOTOGRAPHS COURTESY OF "ORDNANCE MAGAZINE"

Typical spray and dip phosphating equipment and some ordnance products that are now given a protective phosphate coating for extra durability under all kinds of severe exposure conditions. Both military and civilian applications of ACP phosphate coating chemicals are shown in the chart below.

SELECTION CHART OF ACP PROTECTIVE COATING CHEMICALS FOR STEEL, ZINC, AND ALUMINUM

METAL	ACP CHEMICAL	OBJECT OF COATING	TYPICAL METAL PRODUCTS TREATED	GOVERNMENT SPECIFICATIONS
STEEL	"GRANODINE" Zinc Phosphate Coating Chemical	Improved paint adhesion	Steel, iron, or zinc fabricated units or components, automobile bodies, refrigerators, washing machines, cabinets, etc.; projectiles, rockets, bombs, rifles, small arms, belt links, cartridge tanks, vehicular sheet metal, tank bolts and links, recoilless guns, etc.	MIL-S-5002 JAN-C-490, Grade 1 JAN-F-495 U.S.A. 57-0-2, Type II, Class C U.S.A. 51-70-1, Finish 22.02, Class C U.S.A. 50-60-1 16 E4 (Ships)
STEEL	"PERMADINE" Zinc Phosphate Coating Chemical	Rust and corrosion prevention	Nuts, bolts, screws, hardware items, tools, guns, cartridge clips, fire control instruments, metallic belt links, steel aircraft parts, certain steel projectiles and many other components.	MIL-C-16232 U.S.A. 57-0-2, Type II, Class B U.S.A. 51-70-1, Finish 22.02, Class B Navy Aeronautical M-364 U.S.A. 72-53 (See An-F-20)
STEEL	"THERMOIL-GRANODINE" Manganese-iron Phosphate Coating	Wear-resistance anti-galling, safe break-in of friction or rubbing parts. Rust proofing.	Friction surfaces such as pistons, piston rings, gears, cylinder liners, camshafts, tappets, crankshafts, rocker arms, etc. Small arms, weapon components. Hardware items, etc.	MIL-C-16232 U.S.A. 57-0-2, Type II, Class A U.S.A. 51-70-1, Finish 22.02 Class A Navy Aeronautical M-364 U.S.A. 72-53 (See AN-F-20)
STEEL	"GRANODRAW" Zinc-iron Phosphate Coating	Improved drawing, extrusion, and cold forming	Blanks and shells for cold forming, heavy stampings; tubs; tubing for forming or drawing; wire; rod; etc.	———
ALUMINUM	"ALODINE" Protective Coating	Improved paint adhesion and corrosion resistance	Aluminum products of similar design such as refrigerator parts, wall tile, signs, washing machine tubs, etc; aircraft and aircraft parts; bazookas (rocket launchers), helmets, belt buckles, clothes dryers, clothesline, rocket motors, etc., aluminum strip or sheet stock.	MIL-C-5541 (See also QPL-5541-1) MIL-S-5002 AN-F-20 U.S. Navord O.S. 675 16 E4 (Ships) AN-C-170 (See MIL-C-5541) U.S.A. 72-53 (See AN-F-20)
ZINC	"LITHOFORM" Zinc Phosphate Coating Chemical	Improved paint adhesion	Zinc alloy die castings; zinc or cadmium plated sheet or components; hot dip galvanized stock; galvanneal; signs; siding; roofing; galvanized truck bodies; etc.	QQ-P-416 RR-C-82 JAN-F-495 AN-F-20 U.S.N. Appendix 6 U.S.A. 72-53 (See AN-F-20)

CHEMICALS ACP PROCESSES

WRITE FOR DESCRIPTIVE FOLDERS ON THE ABOVE CHEMICALS AND FOR INFORMATION ON YOUR OWN METAL PROTECTION PROBLEMS

CHEMICALS ACP PROCESSES

CALENDAR OF EVENTS

Jan. 14-17, 1952. Plant Maintenance Show and Conference, Convention Hall, Philadelphia, Pa.

Jan. 22-23. 25th Convention of the Association of American Soap & Glycerine Producers, Waldorf-Astoria Hotel, New York.

Mar. 3-7. Spring Meeting of ASTM, Hotel Statler, Cleveland.

Mar. 6-7. Spring meeting of the Southern Paint and Varnish Production Club, Buena Vista Hotel, Biloxi, Miss.

Mar. 10-14. Annual Conference of the National Association of Corrosion Engineers, Buccaneer Hotel, Galveston, Tex.

April 3-5. First Pacific Coast Paint Material and Equipment Exhibit, Biltmore Hotel, Los Angeles, Calif.

May 2-3. Joint Meeting of Dallas-Houston Paint and Varnish Production Clubs, Stoneleigh Hotel, Dallas, Tex.

Production Club Meetings

Baltimore, 2nd Friday, Belvedere Hotel.

Chicago, 1st Monday, Furniture Mart.

C. D. I. C., 2nd Monday.
Cincinnati — Oct., Dec., Mar., May, Cincinnati Club;
Dayton — Nov., Feb., April, Van Cleve Hotel;
Indianapolis — Sept., Claypool Hotel;
Columbus — Jan., June, Fort Hayes Hotel.

Cleveland, 3rd Friday, Hotel Auditorium.

Dallas, 2nd Thursday, No Fixed Place.

Detroit, 4th Tuesday, Rackham Building.

Golden Gate, Last Monday, El Jardin Restaurant, San Francisco.

Houston, 2nd Tuesday, Seven Seas Restaurant.

Kansas City, 2nd Thursday, Pickwick Hotel.

Los Angeles, 2nd Wednesday, Scully's Cafe.

Louisville, 3rd Wednesday, Seelbach Hotel.

Montreal, 1st Wednesday, Queen's Hotel.

New England, 3rd Thursday, Puritan Hotel, Boston.

New York, 1st Thursday, Building Trades Employers Assn.

Northwestern, 1st Friday, St. Paul Town and Country Club.

Pacific Northwest, Annual Meetings Only.

Philadelphia, 3rd Wednesday, Engineers' Club.

Pittsburgh, 1st Monday, Fort Pitt Hotel.

St. Louis, 2nd Tuesday, Forest Park Hotel.

Southern, Annual Meetings Only.

Toronto, 3rd Monday, Diana Sweets, Ltd.

Western New York, 1st Monay, 40-8 Club, Buffalo.

NEWS DIGEST



L. F. Kautz



E. S. Stout

Kautz and Stout Promoted By Sherwin-Williams

Mr. L. F. Kautz, formerly Director of the Newark, N. J. Paint, Varnish and Lacquer Laboratory for Sherwin-Williams, has been appointed Assistant General Superintendent of the Newark Plant. Mr. Kautz has served the paint organization for fifteen years.

Succeeding him as Director of the Newark Laboratory is Mr. E. S. Stout. A graduate of Ohio University, Mr. Stout has fourteen years of technical experience in the coatings industry, both with Sherwin-Williams and the U. S. Navy. Stout joined the organization in 1936.

•

Hercules Powder Promotes Forster and Mayfield

Albert E. Forster has been elected a vice president and member of the executive committee of Hercules Powder Company. Paul Mayfield has been appointed general manager of the Naval Stores Department, succeeding Mr. Forster to that poistion.

The election of Mr. Forster to a vice presidency fills a vacancy created by the recent retirement of Petrus W. Meyeringh because of ill health.

Mr. Forster became associated with Hercules Powder Company in 1925. He was employed in the sales, technical service, and production phases of the Explosives Department, and held responsible executive positions in several Hercules plants and sales offices.

Mr. Mayfield joined Hercules Powder Company in 1925 as a chemist at the company's experiment station. He was engaged for a time in sales and technical service work, developing markets for both cellulose and naval stores products made by Hercules. He was appointed to his present post, assistant general manager of the Naval Stores Department, in 1943.

UCC to Increase Production Of Plasticizer TOF

Expanded facilities for producing "Flexol" plasticizer TOF that is urgently needed for military and defense purposes will be constructed immediately at its South Charleston, W. Va., plant, it was announced by Carbide and Carbon Chemicals Company, a Division of Union Carbide and Carbon Corporation.

Construction of the new unit, for which an NPA Certificate of Necessity has just been granted, will get under way as soon as necessary materials have been obtained. It is expected that production will begin before the latter part of 1952.

•

Glycerine Div. to Hold Annual Meeting on Jan. 22

The Glycerine Division meeting of the 25th Annual Convention of the Association of American Soap and Glycerine Producers, Inc., is scheduled to be held during the afternoon of January 22 at the Waldorf-Astoria Hotel, New York.

An interesting program is planned which will cover such timely subjects as ion-exchange refining of glycerine, the evaluation of crude glycerine and methods for improving yields, and the production and usage trends of glycerine and its substitutes. The meeting is open to the public, and all interested persons are invited to attend.

•

Emery Appointed Chemist At Hock Paint Works

Edgar M. Emery has been appointed plant chemist in charge of experimental and development work at Hock Paint & Chemical Works in Phoenixville, Pa.



SYLOID 308 makes it possible for you to realize new high standards in flatting efficiency . . . producing a modern flat finish at a lower cost. Mill room savings are increased because Syloid mill bases can be made highly concentrated with a very short grinding time. Capacity is often doubled . . . less flatting agent is required.

SYLOID 308 is a finely-sized synthetic silica of extremely high purity. Particle size is controlled to give uniformity in flatting results.

For information on how you can flatten finishes . . . economically . . . uniformly with **SYLOID 308** . . . for help on a specific problem . . . write Davison's Technical Service Department. *T. M. Reg. Applied For

Progress through Chemistry

THE DAVISON CHEMICAL CORPORATION

Baltimore 3, Maryland

PRODUCERS OF: CATALYSTS, INORGANIC ACIDS, SUPERPHOSPHATES, PHOSPHATE ROCK, SILICA GELS, AND SILICOFLUORIDES. SOLE PRODUCERS OF DAVCO GRANULATED FERTILIZERS



NYU Surfaces Finishes Courses Registration, Jan. 30-Feb. 1

New York University, College of Engineering is offering two courses in surface coating technology. Course on evaluation techniques will be given at Washington Sq. on Wednesday evenings, 8-10, and laboratory course will be held at University Heights, Friday evenings, 7-10. Both courses will be given under the direction of Dr. Max Kronstein. For complete details contact Dean H. J. Masson or Dr. Kronstein at Lu 4-0700.



Superintendents of Sherwin-Williams Co. and affiliate plants convene in Cleveland.

Superintendents of Sherwin-Williams Meet in Cleveland

Superintendents of paint, varnish and lacquer plants of The Sherwin-Williams Co. and some of its affiliated companies convened in Cleveland recently for an annual business conference. Presiding were Victor Mills, General Manager of Paint, Varnish and Lacquer Manufacturing, and John S. Prescott, Superintendent of Plant and Equipment.

Topics on the agenda included quality control, production procedures, operating costs and raw materials.

Shown (left to right) are: E. C. Baldwin, Assistant to President A. W. Steudel; R. C. Mack, Assistant Superintendent, Printing Division; W. R. Currens, Dallas; R. E. Weber, Superintendent, Printing Division; G. A. Menz, Superintendent, Cleveland plant; W. W. Gram, Chicago; Dr. N. E. Van Stone, Vice President; John Ferree, Los Angeles; Gordon Daly, Montreal; E. W. Fasig, Dayton; W. O. Michaels, Oakland, Calif.; C. M. Skinner, Montreal; M. W. Hurdlebrink, Chicago; F. H. Lang, Chicago; Donald Mains, Chicago; A. Barkman, Chicago; J. S. Prescott, Superintendent of Plant and Equipment, Cleveland; Harold Spitzer, Chicago; D. A. Kohr, Chicago; C. F. Koch, Cleveland; J. A. Hutchinson, Detroit, and James A. Bradley, Los Angeles.

•

Barrett Names S. Gurley Resin Sales Manager

Sam Gurley, Jr., has been appointed Manager of Resin Sales by The Barrett Division, Allied Chemical & Dye Corporation, New York, N. Y., according to an announcement by R. L. Cammann, Vice President. Mr. Gurley, formerly associated with The Borden Company as Sales Manager, Durite Products, will be in charge of Barrett's expanding operations in the resin field.

ASK FOR ...methyl acetone

47.5—51.0% acetone
27.5—31.0% methyl acetone
20.0—25.0% methanol

Here is an excellent many-purpose solvent that you can order *now* in commercial quantities. Call the nearest Carbide and Carbon Chemicals Company office for prices on Methyl Acetone.

USE METHYL ACETONE as an economical solvent for:

- paint and varnish removers
- lacquer thinners
- varnish resins
- cellulose ester plastics
- nitrocellulose cements

availability:
COMMERCIAL QUANTITIES

CARBIDE AND CARBON CHEMICALS COMPANY
A Division of
Union Carbide and Carbon Corporation
UCC

30 E. 42nd St., New York 17, N.Y. Offices in Principal Cities
In Canada: Carbide and Carbon Chemicals, Limited, Toronto

NEWS DIGEST



Henry N. Lyons

Barrett Named H. Lyons Mgr. of Tech. Service

Henry N. Lyons has been appointed Manager of Technical Service by The Barrett Division, Allied Chemical & Dye Corporation. Mr. Lyons, formerly associated with the Devoe & Reynolds Company, will be responsible for technical service matters in Barrett's Chemical Sales Section.

•

National Starch to Expand Production of Vinyl Polymers

Frank Greenwall, president of National Starch Products, Inc., has announced that the company is launching a $2,000,000 program to expand its resin activities. The first step in the three-year program will double National's present capacity for producing vinyl acetate polymers and copolymers. Plans have been drawn for construction of a new research building to provide additional facilities that are required for the new program.

National intends to market vinyl acetate copolymers in three forms: solution, emulsion, and hot melt. They are said to give adhesion to a wide variety of surfaces, and National offers to "tailor" them on a specialty basis to the user's needs.

A number of the solutions are recommended by National for use in various types of adhesive formulations. Also among the potential applications for the new resin solutions are heat-seal coatings, solvent-reactivating coatings, grease-proof coatings, laminations, high solids lacquers, protective coatings requiring good adhesion, and gloss coatings for paper.

K. S. Markley Receives ACS Southwest Award

Dr. Klare S. Markley of the Southwest Regions Research Laboratories, New Orleans was presented with the 1951 Southwest award of the American Chemical Society at recent annual regional meeting in Austin, Texas. Dr. Markley is an international authority on fats and oils.

•

Appearance Measurement Course To Be Held February 11-15

A training course on appearance measurement will be conducted by Richard S. Hunter, Feb. 11-15, at the Henry A. Gardner Laboratories, Bethesda, Md. The course is designed to aid technologist in measuring color, reflectance, gloss and other appearance attributes of color. For information on enrollment contact the Gardner Laboratories.

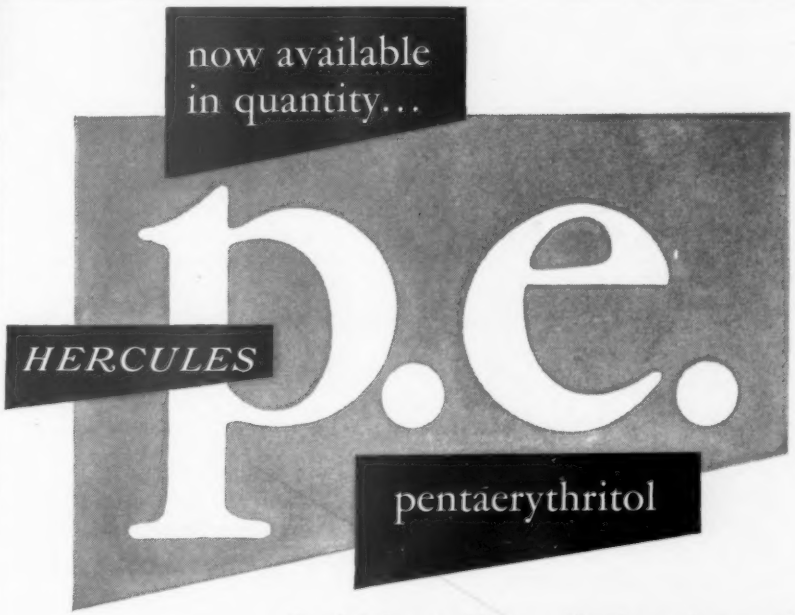
L. Kelly of Du Pont Pigments Retires

Lloyd E. Kelly, of New York, manager of eastern sales for the Pigments Department of the Du Pont Company, will retire February 1 after 30 years with the company. He will be succeeded by Walter J. Beasten, a pigments salesman in the Philadelphia sales office.

•

Raybo Chemical Company Appoints Jameson Agent

The appointment of Jameson Chemical Co. as agent for the Greater Chicago area has been announced by Raybo Chemical Company, 1120 Chester Avenue, Cleveland, Ohio, manufacturers of chemical specialties for paint and allied industries. Jameson Chemical Co. has offices at 218 E. Huron Street, Chicago, Illinois.



for high-quality synthetic resins and oils at substantial savings

DO YOU KNOW ABITOL®?

Another Hercules alcohol—of interest to many diversified industries because of its unusual combination of properties is Abitol (Hercules hydroabietyl alcohol).

A low-cost, high molecular weight resin alcohol, it is a colorless, tacky, viscous fluid at room temperatures. Abitol may be easily reacted, and posesses good stability. It has found application as a raw material for the manufacture of many products, including alkyds, label lacquers, rotogravure inks. Send for testing sample and technical data.

With the completion of expanded production facilities at its Mansfield, Massachusetts, plant, Hercules offers the protective coatings industry and others a dependable source of technical grade P.E. of high chemical purity. This essential ingredient broadens still further Hercules service to the process industries as a supplier of basic chemicals.

Hercules' pioneering in the development of high-quality products containing pentaerythritol began early in the 1920's. This pioneering work and continuing research led to the quantity production of many new P.E. products during the 1940's. At this time, heavy demand for these new products was a major factor in the commercialization of pentaerythritol. Today, as a result of this continuous research and large scale manufacture, not only is P.E. in adequate supply but it has a strong position technically and economically because it makes possible improved properties in many ester-type products at attractive savings.

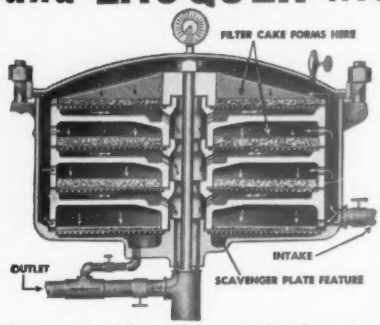
Orders for P.E. are now being accepted at competitive prices, and contracts are available.



HERCULES POWDER COMPANY *Synthetics Dept., 926 Market St., Wilmington, Del.*

IC52-1

CLARIFY VARNISH and LACQUER with... SPARKLER horizontal plate FILTERS





Model 18-S-12 Varnish Filter in mildsteel (steam jacketed)

Every varnish maker can (and most of them do) use a Sparkler Filter to improve the clarity and brilliance of varnishes, lacquers and other clear liquids by removing "fish-eyes," skins, and other incidental solids and semi-solids.

We invite correspondence on any special problem related to either of the above processes. Our engineers are ready to give you the benefit of years of experience in this field.

SPARKLER MANUFACTURING COMPANY, Mundelein, Illinois

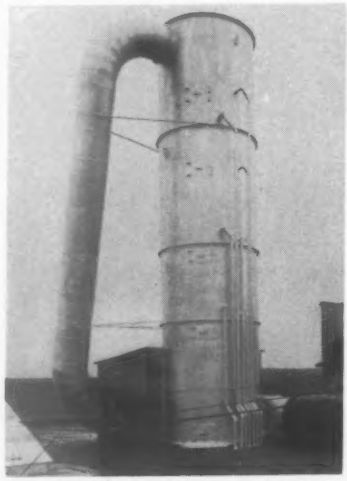
SAVE ROOF MAINTENANCE COSTS— INSTALL A MULTI-WASH SYSTEM

SAVES ON PLANT MAINTENANCE

Roof maintenance and deterioration of stacks, gutters and other equipment can become a costly item. With the elimination of air laden with destructive dust and acid producing vapors or fumes, this alone can very easily justify the expense of a Multi-Wash system.

SALVAGES BY-PRODUCTS

Often materials of value are dissipated into the air, many concerns have collected those materials for extra profit or reuse through the Multi-Wash method. Many times the cost of the Multi-Wash installation have been returned to the plant through such salvage operations.



This special Multi-Wash Collector was designed for multiple liquid operation to remove several gaseous contaminants.

CLAUDE B. SCHNEIBLE COMPANY
P. O. Box 502, Roosevelt Annex
Detroit 32, Michigan

SCHNEIBLE
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NEWS DIGEST



G. R. Monkhouse

Shell Chemical Elevates Monkhouse to Vice Pres.

Mr. G. R. Monkhouse, a 30-year man in Shell companies and presently General Manager, Western Division of Shell Chemical Corporation has been elected to the position of Vice President, Western Division.

•

T. D. Cabot Elected Vice Pres. of Godfrey L. Cabot

Godfrey L. Cabot, Inc., Boston, Mass., world's largest producer of carbon black, announces the election of Mr. Thomas D. Cabot as vice-chairman of the board of directors and executive vice president, at the annual company meetings held on November 15th. Dr. Godfrey L. Cabot was re-elected president and elected chairman of the board, and Mr. Ralph Bradley was re-elected treasurer.

Mr. Thomas Cabot withdrew from active direction in the affairs of the Cabot Companies in the early part of the year, to assume the duties of the Director for International Security Affairs in the office of the United States Department of State. He has now severed his official connections with the federal government and will return shortly to his Franklin Street, Boston offices.

•

Olo Paint Names Haberfeld Ass't. Tech. Director

Henry Haberfeld has recently been appointed assistant technical director of the Olo Paint Co. in Cleveland. He was formerly with Garland Co.

NEWS DIGEST



Emil Spoerry, Jr.

E. Spoerry Named V. P. Of Arco Company

Emil Spoerry, Jr. has been named executive vice-president of The Arco Company of Cleveland, a subsidiary of American-Marietta Company. Mr. Spoerry has been secretary-treasurer and a director of The Arco Company for several years, having joined the Company in 1935.

The Arco Company, well-known for its industrial finishes, automotive refinishing materials and research activities in connection with the application of specialized industrial finishes, was acquired in August, 1951, by the American-Marietta Company, a major manufacturer of paints, chemicals, adhesives, resins, metal powders and diversified building products.

•

DeVilbiss Spray Painting Course

The School of Spray Painting operated by the DeVilbiss Company continues to offer tuition-free instruction for contract painters and their representatives, according to an announcement of the following schedule of classes for the first half of 1952:

Week starting January 21
Week starting March 31

The school, which is maintained for users of DeVilbiss equipment, offers week-long classes for training in the theoretical and practical phases of spray painting. By means of lectures, visual education and actual use, "students" are taught the proper coordination of equipment and correct technique of spraying. There is no charge for attending, the only expenses being transportation, board and lodging.

Those desiring information booklets or application forms should write as far in advance as possible to the DeVilbiss Company, Toledo 1, Ohio, for Form INS 753A.

•

Army Honors Bidlack For Service in World War II

Verne C. Bidlack, president of the Pennsylvania Color and Chemical Co., Doylestown, Pa., was honored by the Department of Army for his contribution to the World War II effort in industrial intelligence. He was one of 12 industrialists from the Philadelphia area to receive this award.

A Certificate of Appreciation signed by Frank Pace, Jr., Secretary of the Army, was presented to Bidlack by Colonel E. M. Sutherland, Chief of the Pennsylvania Military District, at a special ceremony at Franklin Hall in Franklin Institute.

Mr. Bidlack was sent to investigate German industry near the end of the last war as a member of the Technical Industrial Intelligence Committee. He is a member of the Federation of Paint and Varnish Production Clubs and served as executive secretary of that organization for four years.

•

CSC Appoints Giovine Adv. Mgr. of Chemicals Div.

Richard Giovine has joined the Sales Promotion Division of Commercial Solvents Corporation as Advertising Manager for the Industrial Chemicals Division, it has been announced by H. J. Henry, Vice President of Product Divisions.

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5. *Less Filter Cost.* Greater MICRO-KLEAN capacity means fewer cartridges . . . cuts down replacement costs.

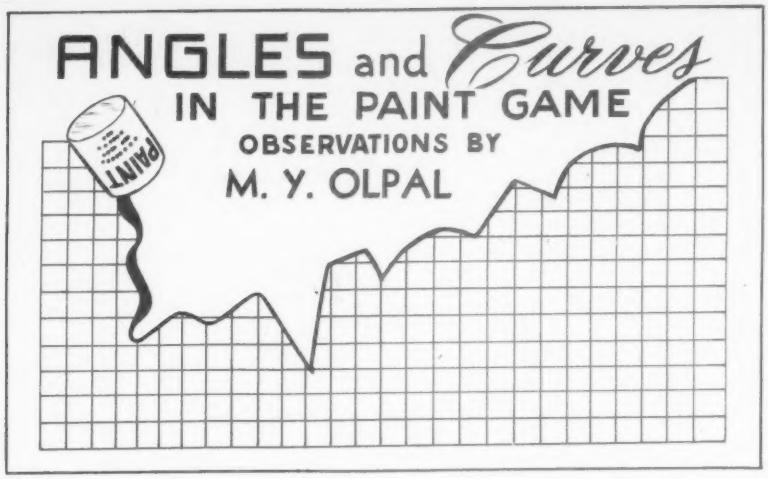
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We are so harrassed by the process of making money that we are not always able to catalog our experiences correctly or to use them most effectively. In addition, we often have to learn by experience — a procedure that is risky and hazardous. Let us look into the life of Mr. M.Y. Olpal, a fictitious character composed of highly experienced technical directors, and see if his tribulations might serve as an aid to the more efficient utilization of our own assets.

"SOMETHING is always popping up in this office," Janie drawled to me as she left the conference with her stenographers notebook in her hand.

"Talking about costs, I suppose," I replied being always quick to catch her meaning.

"Yep, Olpal," Janie said. "But not the regular production costs, or raw material costs. Of all things — construction costs. And this is supposed to be a paint company."

"The boys in there talking to the boss act like smart cookies," she continued, "but they talk like they were a little soggy in the middle. They're trying to sell him on a new pipe dream. They want to build a flat paint plant — not the 98c a gallon flat — but flat like a pancake. A one floor paint plant. They call it an assembly plant and say its built like automobile assembly plants are. Will we be trying to make automobiles next?"

I looked at Janie in her best seater and it was no trouble to see her curiosity showing. Then I told her the facts of business life — costs.

Starting off easy like, I told her, "Our grandfathers built their paint plants high, so when they dropped something it would fall into place, from the top down. That was the only way they had to handle the flow of many different materials. They had to use gravity. Without pumps, conveyors, fork trucks, and individual electric lifts, they just took everything upstairs once and after that let nature take its course. To them labor was cheap and they used plenty of it.

"You were right, Janie, when you said something has popped up. Yes! Labor costs have popped up. So if we build a five story paint plant today we never will be able to pay for it at the price we have to sell our paint. But with the pancake buildings, you can have your cake and eat it too. That is if you're not on a diet and still have teeth. In the pancake plant your costs per square foot of floor space are very low because you only need walls and a roof. You don't need a heavy foundation to support four stories and all the equipment. You don't lay bricks up in the air. Both tricks are slow and expensive and unnecessary to perform. You build nearly all your pancake plants with machinery. And that is cheaper than any labor today."

Janie didn't but-in, so I finished my story like this, "In our pancake plant we can get along without gravity where our grandfathers couldn't. We can pipe and pump our paint wherever we want it and we can convey our pigments to the mills or our finished paint away from them faster than the boss can say 'Yes' to an invite to see a ball game.

"In the end the flat plant costs less to operate too. Everybody can see everybody else without having to look around corners in a stairway. We started off to get lower cost in a plant building but we cut operating costs in production by getting a plant that runs more efficiently.

"So, Janie, that's how we plan to take down the little matter of construction costs if it comes up again. Of course you understand what I'm driving at?"

"Yep," Janie smiled now. "Those cookies in the bosses office are using gas and cooking on the front burner. No wonder they seemed pretty hot while I was in there."

"But don't forget," I told her. "We will make plenty of gloss enamels in our flat paint plant.

•

National Lead Appointments

Paul J. Pater has been named manager of the Chicago Branch. Mr. Pater has been assistant manager of the Chicago Branch since 1944. He joined the Carter White Lead Company in 1916. He became a member of the general office auditing staff, then comptroller of the Chicago Branch in 1937.

Philip W. Ruppert has been appointed assistant manager, metal department, for the company. He will be located in New York City. Mr. Ruppert has been assistant manager of the Chicago Branch since 1949. He started with the company in 1929 as an auditor, becoming assistant manager of the American Lead Corporation in 1935. Two years later he was transferred to the Chicago Branch.

Michael Uss has been appointed assistant treasurer of the company. Mr. Uss joined National Lead in 1942 as an auditor in the general office and in 1948 he was named office manager.

Thomas J. Murphy has been made assistant secretary of National Lead. Mr. Murphy, a graduate of Boston College of Georgetown University Law School, was employed in 1947 in the company secretary's department, handling legal matters.

•

Executive Appointments At Glidden Company

Three top executives of the Glidden Company were named to new positions by Dwight P. Joyce, president.

Harvey L. Slaughter, regional director of the Paint and Varnish Division in Reading, Pa., has been appointed general manager of Glidden's important Durkee Famous Foods Division, succeeding George F. Atkinson, who has been named executive assistant to the president. H. F. Winger, regional director of the Paint and Varnish Division in Chicago, will replace Mr. Slaughter in Reading.

PATENTS

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PATENTS AND COPYRIGHTS

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Complete copies of any patents or trade-mark registration reported below may be obtained by sending 50c for each copy desired to Lancaster, Allwine & Rommel.

Coating Composition

U. S. Patent 2,576,308. Peter Nordon, Bondi Junction, near Sydney, New South Wales, Australia, assignor to Industrial Metal Protectives, Inc., Wilmington, Del., a corporation of Delaware.

A liquid coating composition comprising a dispersion of zinc dust in an aqueous solution of alkali metal silicate and a higher oxide selected from the group consisting of hydrogen peroxide, lead peroxide, barium peroxide, sodium perborate, potassium chlorate, potassium periodate, manganese dioxide and sodium persulphate, said higher oxide being present in a minor proportion effective to prevent frothing and to increase the life of the mixture, the ratio of alkali metal oxide to silica defined in moles being 1:2.4 to 1:3.0.

Drying Oils From Clay Polymers

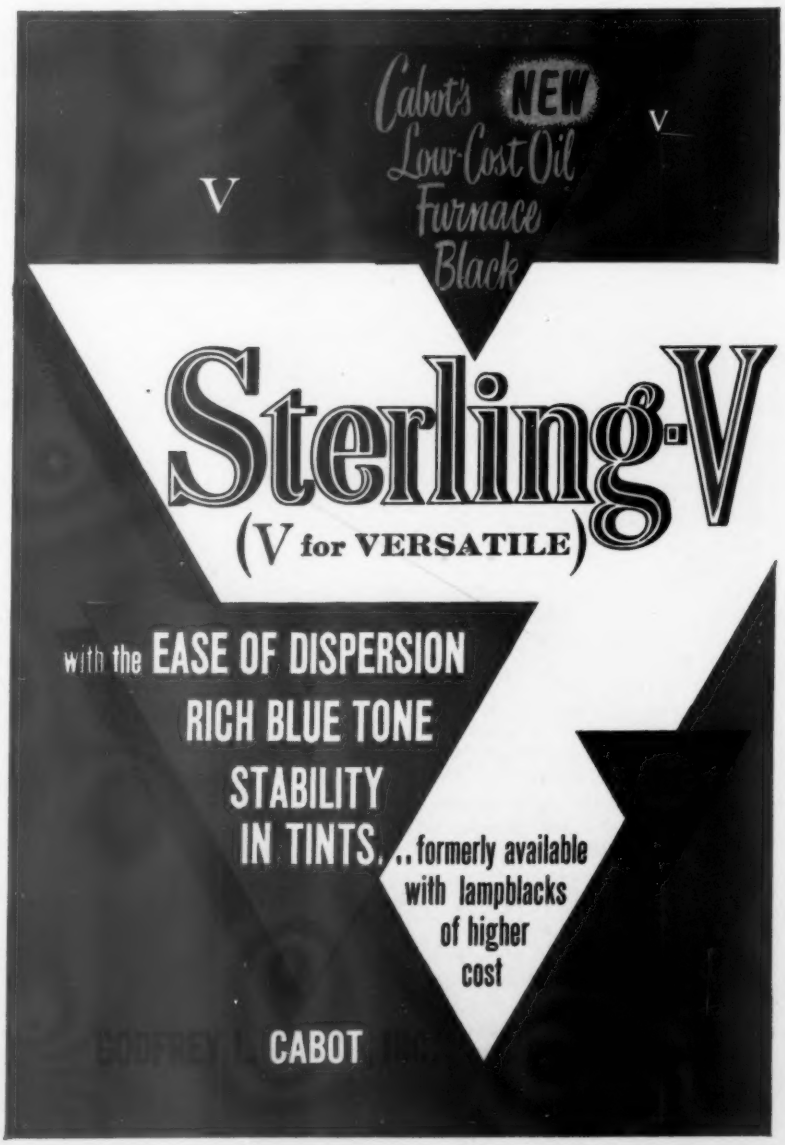
U. S. Patent 2,569,595. Leon M. Adams; Texas City, Preston L. Brandt, Galveston, Robert J. Lee, La Marque, and Francis T. Wadsworth, Dickinson, Tex., assignors to Pan-American Refining Corporation, Texas City, Tex., a corporation of Delaware.

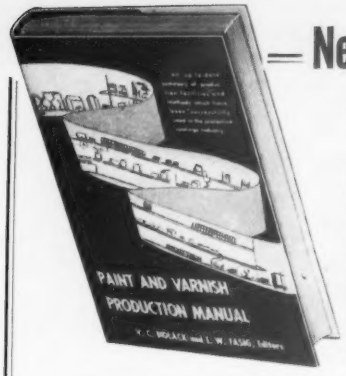
A process for preparing a drying oil of superior quality from clay polymer, which comprises distilling crude clay polymer and separating therefrom a reduced clay polymer having a viscosity between about 200 and 1000 SSU at 210°F., fractionally distilling said clay polymer at an absolute pressure between about 5 and 10 mm. Hg and separating therefrom a drying oil as a distillate fraction and a drying resin as a bottoms fraction having a softening point between about 150 and 300°F. (ring and ball test), dissolving said drying-oil distillate fraction in a petroleum naphtha in a distillate-to-naphtha ratio between about 0.25:1 and 4:1, contacting the resulting solution with between about 5 and 15 percent by weight, based on said drying-oil distillate fraction, of sulfuric acid having a concentration between about 90 and 100 percent for a period between about 0.5 and 10 minutes at a temperature between about 30 and 200°F., thereby polymerizing color bodies originally present in said drying-oil distillate fraction while reducing the iodine number of said fraction between about 5 and 20 percent, withdrawing an acid sludge containing the resulting polymerized color bodies, contacting the treated solution with an active clay, separating said petroleum naphtha from the resulting clay-treated solution, and recovering a drying oil having an ASTM color below about 5 therefrom.

Oxidation of Oleic Acid

U. S. Patent 2,572,892. Daniel Swern and Hogan B. Knight, Philadelphia, Pa., assignors to United States of America as represented by the Secretary of Agriculture.

A process of producing 9,10-dihydroxystearic acid comprising contacting oleic acid, dissolved in about twice its weight of acetic acid containing an amount of cobalt acetate corresponding to at least 0.25% of cobalt on the basis of the oleic acid, with a free oxygen-containing gas at a temperature of about from 50 to 100°C., thereby converting the oleic acid to oxidation products containing 9,10-dihydroxystearic acid in admixture with monocarboxylic and dicarboxylic aliphatic acids having an average chain length of about nine carbon atoms.





New guide to profitable paint production

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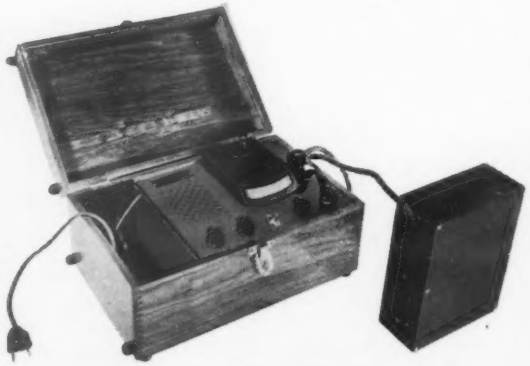
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Refined Tall Oil

U. S. Patent 2,575,013. Torsten Hasselstrom and Michael Stoll, New York, N. Y., assignors to mesne assignments, to National Distillers Products Corporation, New York, N. Y., a corporation of Virginia.

The method for the production of a refined tall oil which comprises admixing a material selected from the group consisting of sulfuric acid and sodium acid sulfate with an intimate mixture of an aqueous tall oil soap, containing sterols and color bodies, and a hydrocarbon solvent until the pH value of the aqueous phase is below 7, permitting the mixture to stand for a period sufficient for the formation of an aqueous lower layer containing color bodies and a supernatant layer containing tall oil dissolved in the solvent, discarding the lower aqueous layer and recovering the tall oil for the supernatant solvent layer.

Paint Composition

U. S. Patent 2,573,038. Ralph E. Madison, Detroit, Mich., assignor to Devoe & Raynolds Company, Inc., New York, N. Y., a corporation of New York.

A method of preparing a paint composition which comprises: milling factice on a roll mill; dispersing said factice in 0.25 to 4.0 parts of chlorinated rubber and an organic solvent having a kauri butanol value above 80; and grinding with pigments until the particle size has been reduced to approximately 3 on the Hegman gauge.

Wax Products

U. S. Patent 2,573,423. John J. Fish, New York, N. Y., assignor to Sun Chemical Corporation, New York, N. Y., a corporation of Delaware.

A wax composition characterized by the property of forming stable emulsions in water, which emulsions upon drying, form highly glossy films, comprising the product obtained by subjecting a hydrocarbon wax material comprising predominantly hydrocarbons solid at normal room temperatures to treatment with an oxygen-containing gas, at a temperature of at least 270°F., but below the temperature at which decomposition of the said wax material occurs, in the presence of 1-10% by weight of a polymerized lower alkylene hydrocarbon material, 0.3 to 1.0% by weight of chlorinated paraffin, an oxidation catalyst and about 0.5% by weight of a material selected from the group consisting of drying oils, blown drying oils, semi-drying oils, blown semi-drying oils, and mixtures thereof, said oxygen-containing gas being introduced at the rate of approximately 1.7 cu. ft. per hour per pound of said wax material, said wax composition having an acid number of not less than 12, a ratio of saponification number to acid number of at least 3 to 1, a melting point of approximately 192 to 196°F., and a penetration value below 7.

Pigmented Coating

U. S. Patent 2,572,252. Hendrik de W. Erasmus, Lewiston, and James B. Culbertson, Lockport, N. Y., assignors to Union Carbide and Carbon Corporation, a corporation of New York.

A pigmented coating composition comprising a paint vehicle and finely-divided silicon nitride selected from the group consisting of white and gray silicon nitride as a pigment therein.

Noncrystallizing Rosin

U. S. Patent 2,576,094. Justus C. Barthel, Stamford, Conn., assignor to American Cyanamid Company, New York, N. Y., a corporation of Maine.

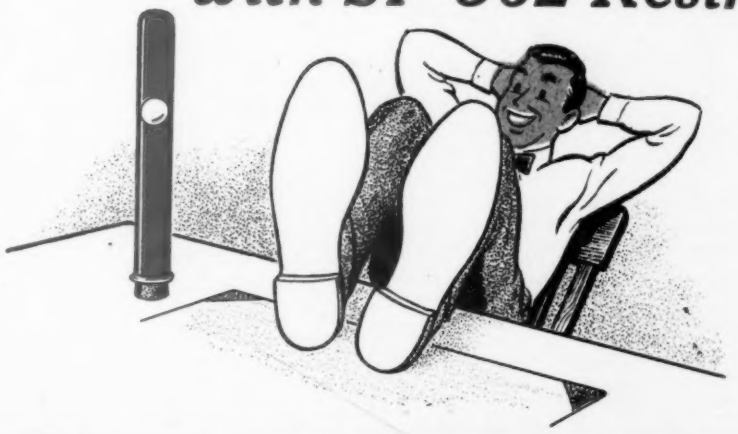
The method which comprises heating rosin at from 250 to 300°C. with from 0.1% to 1.0% of phenothiazine for not less than 15 minutes.

LANCASTER, ALLWINE & ROMMEL
REGISTERED PATENT ATTORNEYS

•

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Paint and Varnish Production Manual

Edited by Verne C. Bidlack (Pennsylvania Color & Chemical Co.) and Edgar W. Fasig (Lowe Brothers Co.) Published by John Wiley & Sons, 440 Fourth Ave., New York, N. Y. Price $6.50.

This manual is concerned with important problems connected with setting up and operating a paint and varnish plant. Topics covered include paint production equipment and installation of such equipment used during the various stages of paint production. Considerable attention is also given to price calculation, quality control, and paint testing. The authors also discuss the important subject of employer-employee relations.

Extensive references are given to each of the problems discussed. These usually refer to, the most part for Mattiello's, works and the various volumes of the Official Digest.

This manual fulfills two aims:

1. It acts as a ready reference and guide for those directly connected with factory and production problems.

2. It collates and compiles the many technical subjects covered in the Official Digest over the many years with the idea that these may be referred to in a study of a particular production problem.

DEVELOPMENT AND —

(*From page 37*)

we build our final structure bit by bit, a pre-supposed structure serves as a means of economizing time and effort required in research. Effective research is planned Research. A plan is a review of available data classified into structure insofar as possible, decision as to what needs to be filled in, timetable for doing the work, check-up to verify accuracy, pertinence, review of new structure. Without first determining a structure to be filled in or enlarged from, research becomes haphazard, without direction, without rational limits and extravagant of time and money.

End Product of Research

THE structure assembly of data, predicted, completed (reasonably or as is necessary) shown by parts, functions, relationships is the end product of research. It is information systematized and available for use—information in proper setting and perspective.

This is a path of structure-finding operations. It is over a century ago that chemists first started drawing structural charts and calling them "periodic charts" of the chemical elements. Working from structure and accumulating verified data and relationship information they:

1. Discovered new elements
2. Predicted the existence of, set out to find and found new elements.
3. Discovered that supposed elements were mistures of similar elements.
4. Transmuted elements, etc.

From this single illustration you can see that research men are accustomed to working from structure. Today, the Coatings Materials Industry, like all modern industry is becoming increasingly aware of potentialities of working from structures of information. When structure working becomes industry wide we will see more direct simplified and precise conduct of activities in all departments.

We have discussed the mechanics of our research technic, detailed the steps necessary for carrying forward the research, and we have used some work with gloss paints as an example of how these steps are taken. But the principles of working we have pointed to are by no means restricted to paint work. They are basic principles. The steps outlined are those taken in any type of research.

The Coatings Materials Industry, until recently, has generally restricted research work to laboratory studies later used for formulating new products or for work in connection with raw materials.

But now, the Research Technic, the working-toward-structure approach, is use for new understanding and re-evaluation of Market Survey Methods, Distribution systems, Process Operations, Management Systems, and Budget Control.

Do you get the impression that Research Technic is only mechanical? Do you think research consists only of planning, testing, recording, charting? Then reconsider in another light, consider research as a warm human sort of job.

In human terms, the results of research are a series of broad logical ever-widening perspectives, respect for breadth of vision, awareness of relationships, foundations in experimental detail.

In human terms, the conduct of research is "contact." Contact with materials as we handle them; contact with the mind as we arrange and evaluate our doings; contact with the emotion as we stick to a difficult task or keep asking why when everyone else seems to have an answer.

The Research man soon becomes an unsatisfied explorer, who, as he gets at the top of one hill sees many higher and more intriguing hills that he has to explore, and in so traveling, he charts the ground on which industrialists later build.

•

ADM Opens Office In Cincinnati

Archer-Daniels-Midland Company has recently opened a sales office at Cincinnati, Ohio. The office, located at 1133 Federal Reserve Bank Building, will be managed by Daniel J. Marien, Jr.

The Cincinnati office will handle the following ADM products: linseed oils, soybean oils, fish oils, fatty acids, chemically modified oils and Archer Pol-mer-ik Linseed Oil. It will also represent the ADM Chemical Products Division for the following: sperm oil, glycerides, fatty alcohols and hydrogenated fatty acids.

•

P. C. Witbeck Heads G-E Technology Program

Paul C. Witbeck has been appointed supervisor of the General Electric Company's process technology program with headquarters in Pittsfield, Mass.

In his new position, Mr. Witbeck will supervise the company's two-year process technology program which provides advanced training for chemists, chemical engineers, and metallurgists.

•

Shell Chemical Opens Sales Office in Atlanta

In a move designed to give better service to a rapidly expanding southern economy, Shell Chemical Corporation opened a new sales office in Atlanta, Georgia, M.W. Ellison, of the sales staff in New York, has been appointed manager of the new sales district.

TECHNICAL Bulletins

TESTING EQUIPMENT

80-page catalog summarizes for the first time under one cover all of the General Electric Company's testing and measuring equipment for laboratory and production line use.

To be used primarily as a reference to the apparatus available for the complex measurements to be made in industry, the catalog (GEC-1016) contains more than 150 photographs and diagrams and describes the uses, features, specifications and prices of more than 130 G-E testing and measuring equipments. It also contains publication references to G-E bulletins that describe each device in more detail. General Electric Co., Schenectady, N. Y.

MIXING and GRINDING MACHINERY

Charles Ross & Son Company, 148-156 Classon Ave., Brooklyn 5, N. Y., has issued its new, complete, fully illustrated catalog Number 118A. Complete details and specifications are given on latest model high speed three roller mills in sizes 4½″ x 10″, 6″ x 14″, 9″ x 24″, 12″ x 30″, 14″ x 32″, and 16″ x 40″. Double arm Kneading Machines with mixing or dispersion type blades are fully described and illustrated in one pint to one hundred fifty gallon sizes. Mixers of all types, both horizontal and vertical, are shown for the thorough mixing of heavy paste materials, semi-paste, liquids and dry products. Sizes vary from laboratory or pilot scale size to large production size units. Complete details are given on two speed or variable speed motors, jacketed tanks for steam heating or water cooling, and various types of motor drives. In addition, special types of equipment are shown which are designed and offered for particular processing requirements.

PETROLEUM RESINS

Technical brochure discusses the physical and chemical characteristics of line of synthetic petroleum resins and covers their use in protective coatings, floor coverings, printing inks, etc. American Mineral Spirits Co., 230 N. Michigan Ave., Chicago, Ill.

FUNGICIDES

Thirty-three page booklet covers copper naphthenate, copper 8-quinolinolate, phenyl mercury salt, zinc naphthenate. Active metal content, percent solids, flash point, volatile solvent, and viscosity are given. Each fungicide is discussed covering test methods for determining resistance to fungal attack, crocking, flexibility, percent loss on leaching, determination of metal and nonvolatile matter in fungicides and treated fabrics. Federal specifications are also included. Ferro Chemical Corp., Bedford, Ohio.

RECONDITIONING EQUIPMENT

8-page booklet has been published by J. M. Lehmann Company, Inc., 550 New York Avenue, Lyndhurst, New Jersey. This booklet "Lehmann Certified Reconditioning Service — right to the roots," describes the company's methods of reconditioning their customers' machines in the Lehmann factory. Copies are available on request to the company.



LEAD INDUSTRIES BULLETINS

"White Lead In Mixed Pigment House Paints" is a sixteen page booklet that tells why white lead is vitally needed in house paints as a stabilizer, plasticizer, strengthener, water resistor and means of improving appearance. It also tells how white lead pigments should be used in paints to realize improved quality, durability and appearance.

The booklet is supplemented by a technical bulletin containing five primer and eight finish paint formulations. A variety of mixed pigment formula types are included to meet a range of geographical, marketing and other requirements.

Twenty page booklet entitled "Red Lead Technical Letter No. 6" contains formulations that have been found to give outstanding protection to ferrous surfaces under many types of service conditions. Included are formulas for use under ordinary atmospheric conditions, severe atmospheric conditions (as encountered in industrial, coastal or tropical areas), tidewater exposures, and submerged exposures in both fresh and salt water.

This bulletin contains a formula index and table of general properties to aid formulators and specifiers in selecting paints for their particular requirements. Suggested uses are listed for each formula. Lead Industries Ass'n., 420 Lexington Ave., New York 17, N.Y.

CELLULOSE GUM

The many important applications for Hercules CMC, and its physical and chemical properties, are fully described in a new technical booklet published by Hercules Powder Company, Wilmington, Del.

The list of industries already using Hercules CMC (cellulose gum) includes pharmaceutical, cosmetic, detergent, laundry, textile and paper processing, adhesives, lithography, and ceramics. The list continues to grow because of CMC's many useful properties which are described in the new booklet.

The booklet is intended to give the reader an indication of how CMC might help him solve his technical and economic problems.

OILS AND RESINS

Compact catalog covers company's entire line of products including linseed oil, alkyd resins, fish and soya oils and specialty products. Catalog is in three colors on a heavy coated stock with easy to read tabs for quick references to each of the products manufactured. All specification data has been subdivided into groups in a new format that assures the greatest possible legibility and ease of reading. "Falk Facts" can be filed in a standard letter file or used in a three ringer binder. Write to Falk & Co., P.O. Box 1075, Pittsburgh 30, Pa. on company letterhead for your copy.

WEIGHTS & MEASURES

Handbook deals with commercial measures and measuring devices and completes a series of four such handbooks covering methods and regulatory activities. Besides covering measuring devices, the book recommends equipment for testing these devices and explains step-by-step methods. Requirements of testing procedures based on code specifications, tolerances, and regulations are also outlined. National Bureau of Standards Handbook, "Testing of Measuring Equipment" can be obtained by remitting $1.25 direct to Government Printing Office, Washington 25, D. C.

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SOLVENTS

Technical catalog shows tabulation results of tests taken to determine specifications and physical characteristics of naphthas, petroleum solvents, and paraffin hydrocarbons. Chart indicates application of various solvents in paints, varnishes, rubbers, etc. American Mineral Spirits Co., 230 N. Michigan Ave., Chicago, Ill.

COLORIMETER

Four page bulletin explains oil color photometry of vegetable oils and fats by means of a photoelectric interference-filter colorimeter. Photovolt Corp. 95 Madison Ave., New York, N. Y.

DRIERS

31-page booklet contains complete information on physical and chemical properties of all types of driers offered by Harshaw Chemical Co. The data has been compiled with the idea of giving the technical men working with drying oils and resins practical information on the selection and use of driers. Harshaw Chemical Co., 1945 E. 97th St., Cleveland, Ohio.

STRAINERS

Several types of pipe line strainers for all purposes ranging in sizes from ½" to 36", some of which embody new concepts of design and function for making continuous production processes possible, are described and illustrated in a new Pipe Line Strainer Data Manual available by J. A. Zurn Mfg. Co., Erie, Pa. Summarizing important developments resulting from Zurn continuous engineering research in fluid handling equipment, this illustrated manual carries information on the factors to consider in selecting type and size of strainer for a specific application, and the effect of flow rate, screen loading and the viscosity of fluid on pressure drop.

BLACK DISPERSIONS

Properties and uses of carbon black dispersions in various vehicles are discussed in circular issued by R-B-H Dispersions, Div. of Interchemical Corp., Bound Brook, N. J.



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1951 PROGRESS

(*From page 11*)

CONICAL BLENDER — All porcelain type; holds 56 gallons. *Paul O. Abbe, Inc.*

CHANGE CAN MIXER — For mixing small batches; pilot plant sizes. *Charles Ross & Son Company.*

CONTINUOUS MILL — Heavy duty ball or tube mill with improved mechanical features; for fine or coarse grinding, wet or drying grinding. *Patterson Foundry & Machine Company.*

DISPERSING UNIT — Cylindrical shape like a cone; revolves at high speeds; may be used to blend 2 liquids of different specific gravities; insures thorough wetting. *Premier Mill Corp.*

DISSOLVING TANKS — Tank dissolves lumps of resin in cold solvent; capacity; stainless steel. *Brighton Copper Work, Inc.*

DRUM HANDLING — Device is adaptable to any fork truck, completely automatic. *Yale & Towne Manufacturing Co.*

GRINDING MEDIA — Natural shape media is said to increase as much as 40% the dispersion rate of paint pigments in pebble mills; made of high density alumina ceramic material. *Landes, Zachary & Peterson.*

HAND TRUCK — For loading and unloading heavy drums; light weight; maneuverable. *Clark-Hopkins Equipment Corp.*

KNEADER — Double bladed with different stirrers available for operation at the same or differential speeds; quick dumping; jacketed types available. *Charles Ross & Son Company.*

LABELER — Machine eliminates hand labeling of 5 gallon steel drums; will do both spot and wrap around labeling; rate 185 gallon drums per minute. *Burt Machine Company.*

MIXER — Gas heated type for mixing processes requiring heat control; used in the manufacture of paints. *L. O. Koven & Brothers Inc.*

MIXER — Heavy duty type, meets A S M E code; for blending viscous materials. *L. O. Koven & Brothers, Inc.*

MIXER — Sizes 50 to 1500 gallons, furnished with paste or liquid stirrers. *Charles Ross & Sons Company.*

MIXING UNIT — For speed emulsification; used where propellers are ineffective. *Premier Mill Corp.*

PAINT FILLER — Unit fills paints and allied products, places covers, and seals cans, completely automatic. *Elgin Manufacturing Co.*

PAINT MIXER — Laboratory size; fast and thorough blending and mixing action. *Holt Manufacturing Company.*

PASTE MIXER — Heavy duty type; automatic cut-off for safety; capacity 150 gallons; handles heavy viscosities. *Charles Ross & Son Co.*

PASTE MIXER — Stainless steel; heavy duty; jacketed around the bottom. *L. O. Koven & Brother Inc.*

PORTABLE MIXERS — Explosion proof; both plain and direct drive types; mixer is light and sturdy. *Patterson Foundry & Machine Co.*

PUMP — Compact; Handles viscous liquids. *Eco Engineering Co.*

RESIN UNIT — Synthetic resin unit with capacity of 3,000 gallons; equipped with radiant heat furnace; built of stainless steel. *Brighton Copper Works, Inc.*

RUBBER DRUM — 55 gallon synthetic rubber drum; can be collapsed; suitable for shipping paints. *U. S. Rubber Co.*

LABORATORY EQUIPMENT

BLADE APPLICATOR — Wedge-shaped applicator for control of wrinkle finish production. *Henry A. Gardner Laboratory Inc.*

CONTROLLER UNIT — Two instruments automatically control heating of four cooking stills used in manufacture of synthetic resins and varnishes. *Tagliabue Instrument Division; Weston Electric Instrument Corp.*

GLOSSMETER — Improved, portable type; new optical designs; for quantitative studies. *Henry A. Gardner Laboratory Inc.*

MOISTURE METER — Measures moisture content of lumber wood, plaster and many other materials. *Tagliabue Instrument Division, Weston Electric Instrument Corp.*

TEMPERATURE BATH — Constant temperature bath for use with capillary viscosimeter is designed with turbine type stirrer; bath provides good temperature control. *Emil Greiner Co.*

THICKNESS GAGE — Direct reading and can be made on curved surfaces; measures dry film thickness. *Henry A. Gardner Laboratory Inc.*

VISCOMETER — Inexpensive type; based on principle of allowing liquid to be tested to flow through a calibrated office; quick measurement. *Henry A. Gardner Laboratory Inc.*

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abstracts



Relationship Between Organo-Silicons and Carbon Compounds

Gilman, Henry and Dunn, G. E. Presented before the Div. of Polymer Chemistry of the American Chemical Society, Sept. 3-7, 1951, New York.

Relationship between organic compounds of silicon and carbon are based, in large part, upon the facts that the two elements have the same normal covalence and bonding orbitals, but different atomic weights, covalent radii, electronegativity, and maximum covalence. Similarities are most noticeable in the physical properties, and differences in the chemical properties, of analogous compounds of the two elements.

The greater size of the silicon atom is illustrated by the ease of formation of such compounds as tetraphenylsilane and hexaphenyldisilane, but the unreactivity of silicon compounds containing highly α-substituted groups shows that steric interference between groups attached to silicon does occur.

There are no organosilicon compounds in which silicon has a convalence greater than four, but the unexpected shortness of siliconfluorine bonds, the greater acidity of silanols and silylamines over alcohols and amines, respectively, and the probable mechanisms of hydrolysis of silicon halides and hydrides, all suggest that structure on which silicon is more than four-covalent are of considerable importance.

Well-authenticated compounds containing silicon-silicon or silicon-carbon double bonds are unknown, and evidence that resonance contributions from such structures are small is found in the sigma constant for the trimethylsilyl group, the ultraviolet absorption spectra of triarylsilanols, the rates of hydrolysis of substituted silanes, and the nonformation of triarylsilyl radicals.

Introduction of Functional Groups into Organosilicons

Benkeser, Robert. Presented before the Div. of Polymer Chemistry of the American Chemical Society, Sept. 3-7, 1951, New York.

Organosilicon chemistry is somewhat hampered at present by the lack of adequate methods of synthesis. It is particularly difficult at the moment to introduce functional groups into the aromatic nucleus of a mixed aklylaryl silane. Acidic reagents and halogens often split the aromatic carbon-silicon bond during an attempted substitution reaction, thus forming cleavage fragments rather than the desired substitution product:

$$(\text{alkyl})_3\,\text{Si-aryl}\ \text{Br}_2 \longrightarrow (\text{alkyl})_3\,\text{SiBr} + \text{aryl-Br}$$

Preliminary investigations in our laboratory on the mechanism of this halogen cleavage indicate that it probably involves an attack by a cationic bromine atom on the carbon atom attached to the silicon. The kinetics of this cleavage as well as the general mechanism proposed are consistent with that suggested by De La Mare and Robertson. (J. Chem. Soc., 1943, 276) for aromatic halogenation.

In connection with these substitution studies we have found it possible to nitrate several unsymmetrical alkylaryl silanes and siloxanes with a mixture of copper nitrate in acetic anhydride without excessive cleavage of the aro-



matic carbon-silicon bond. For examples, trimethylphenylsilane can be nitrated with this reagent to yield a 30/40/30 ortho-meta-para isomer ratio. This indicates that the trimethylsilyl group is a weak ortho-para director.

With the advent of new and more simplified procedures for the preparation of silicon organometallics, an important tool is at hand for altering the aromatic silane molecule through these reactive intermediates. It is now possible to convert linkages like Si-H, Si-Cl, Si-Si, and Si-OR to organometallic derivatives. These latter products have already shown some of the versatility of the Grignard reagent. Thus the problem of substitution in mixed aliphatic-aromatic organosilanes is slowly being solved.

Polymer Chemistry of Linear Siloxanes

Hunter, M. J., Barry, A. J., and Warrick, E. L. Presented before the Div. of Polymer Chemistry of the American Chemical Society, Sept. 3-7, 1951, New York.

This paper discusses the polymers containing a base chain of alternate silicon and oxygen atoms, the siloxane chain, with respect to the unusual physical properties which early made the polymer chemists to discover the sources of these valuable attributes.

Commercial exploitation centered on the properties of low temperature coefficients of viscoelastic properties, low surface tension, low temperature "fluidities," high temperature stability, water repellency, low dielectric losses, lubricity, and a number of lesser known but equally unique properties.

The efforts of polymer chemists have been directed to study of the influence of chemical structure and molecular architecture of these unusual properties. Chemical structure seems to be the predominant influence and may be subdivided in its effects into intrachain, inter-chain, and extrachain forces.

Intrachain forces are those which control rotational freedom around the bonds in the base chain. These forces may be studied directly by x-ray diffraction measurements of average chain configurations or indirectly by the effect on properties by changing the composition of the base chain. These measurements all concur in the conclusion that freedom of rotation about an Si-O bond is great indeed.

Interchain forces have been studied in many ways. Most of these depend upon measuring directly the forces required to slip one chain or a segment past another chain or segment. Some are indirect in nature and require the determination of the effect of temperature on a given property. Again the consensus is that interchain forces, particularly in the dimethylsiloxanes, are low indeed. It is the combination of free rotation and low interchain forces which yields the many remarkable properties which qualitatively have their basis in a low internal pressure for the polymers.

Extrachain studies are concerned with the effect of outside agents such as oxygen on these polymers. Undoubtedly the excellent high temperature stability, as measured by quantitative oxidation studies stems from some bond strengthening inductive effect which has not been isolated.

The effect of physical structure on basic properties seems limited to viscosity and molecular weight phenomenon. The rubbery nature of high molecular weight polymers has its origin in the inter-intra chain force effects and is only secondary a function of molecular weight.

Coloration of Resins

Dawankow, A. B., Perepelkin, W. P. and Sokolowa, E. A. Journal Applied Chemistry (Russian), 24 (1951) 95-101.

The authors of this Report conducted numerous experiments, drawing the following conclusions from the results obtained:

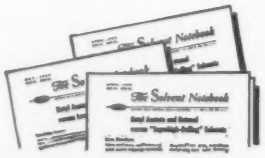
1. The emulsion polymers are characterized by selective adsorption and adsorb only basic dyes from hydrous solutions.
2. It is possible with the aid of suitably selected synthetic resins to separate one dye from another.
3. The dyeing of finely dispersed polymers by means of hydrous solutions of dyes may be considered a process of

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chemical reciprocal action between the dye-base and the acid polymers. The following facts confirm these findings:—

a. the acid character of the emulsion polymers obtained as initiators in presence of super-acid compounds.
b. the coagulation and precipitation of the polymer during the dyeing process.
c. the high degree of stability of the dyed complex toward the influence of light and chemical reagents.
d. the solubility of the dyed polymer in organic solutions with the formation of intensively colored solutions in which the original dyes themselves are practically insoluble.

Protection of Magnesium

Weib, H. In communication with the Chemical Research Institute of Austria.

The first section of the publication deals with the chemical surface treatment of magnesium surfaces by etching with nitric acid or hydrofluoric acid solutions containing chromium salts and other oxidizing agents, by electrolytic processes in alkaline solutions, influence of alloying constituents of magnesium, coloring of the surface films, etc. The films obtained by any of these processes are only 0.005 — 0.040 mm thick so that for maximum corrosion protection they should be reinforced by suitable varnish or lacquer film.

In selecting the film materials attention must be paid to the fact that magnesium is highly resistant to alkaline substance but not to acid reagents. The pH-values must therefore range above 7. The varnish may even contain a slight amount of alkaline substances. Since magnesium is sensitive toward free formaldehyde, chlorine or hydrochloric acid, the varnish materials must not contain these substances or tend to separate them during the drying process. This danger does not exist in the case of stoved phenol resin films. Air-drying varnishes and lacquers should contain organic magnesium compounds or other magnesium compounds serving as catalysts.

Films Containing Aluminum

Mueller, A. Industria Vernice, 3 (1949), 5-7.

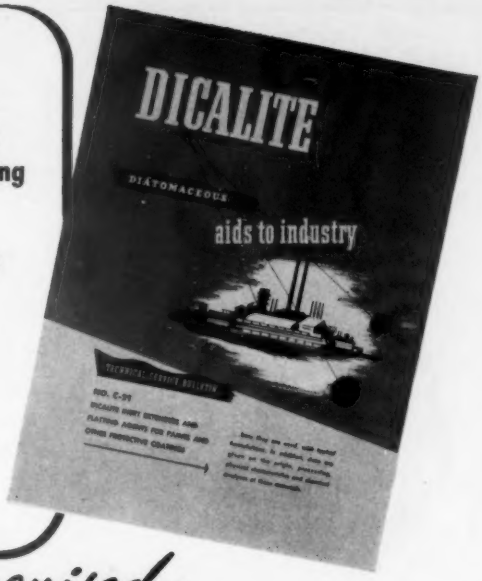
In an article published in Industria Vernice, 1948 (2) pp. 125 etc. Salamone claims that paints and varnishes containing standard aluminum powders are neither very durable nor corrosion-resistant. A. Mueller studied these claims and conducted suitable tests proving that if the aluminum powders were well selected and the paints and varnishes manufactured according to best practices the films produced are very durable and highly resistant to atmospheric and other types of corrosion.

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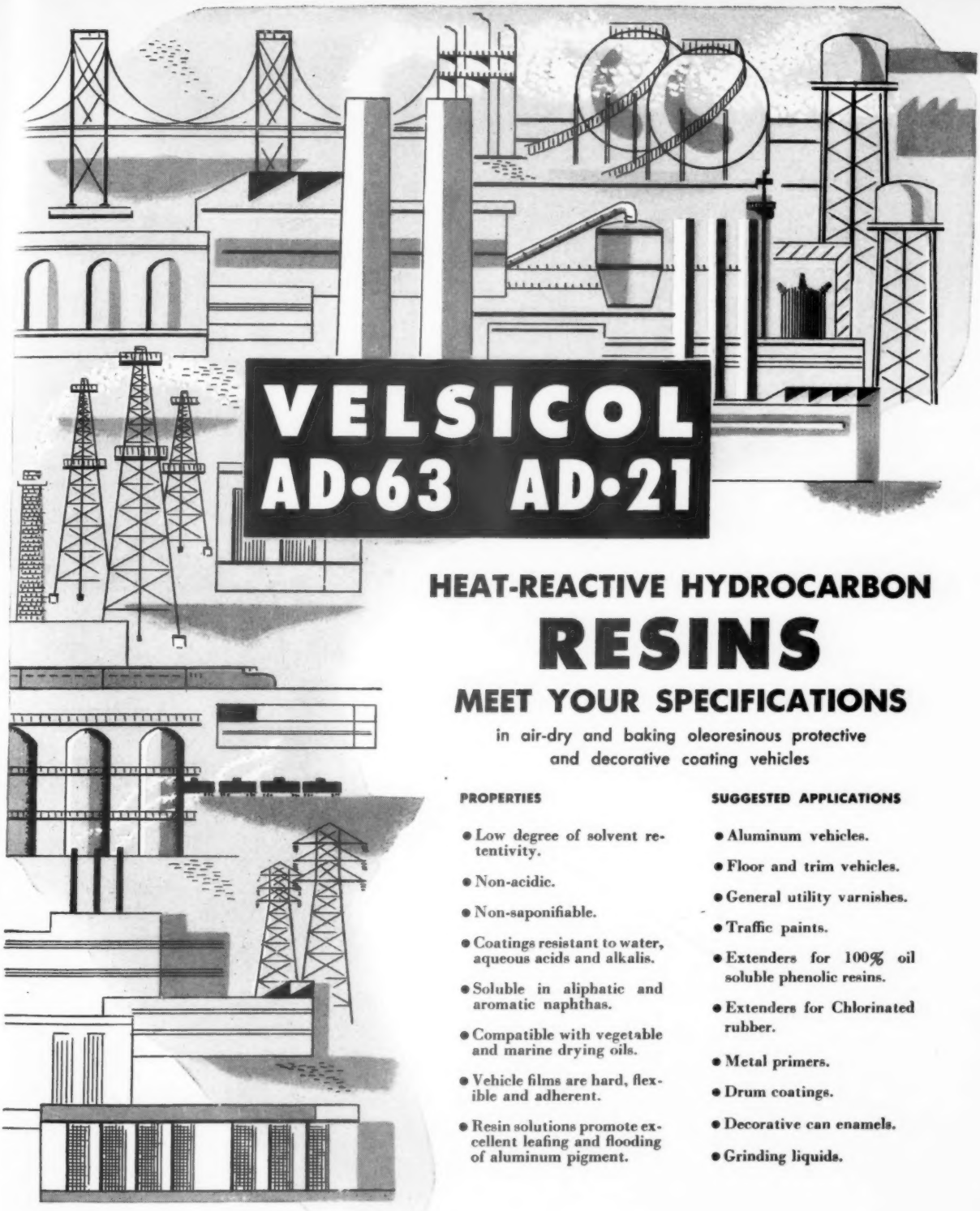
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- Grinding liquids.

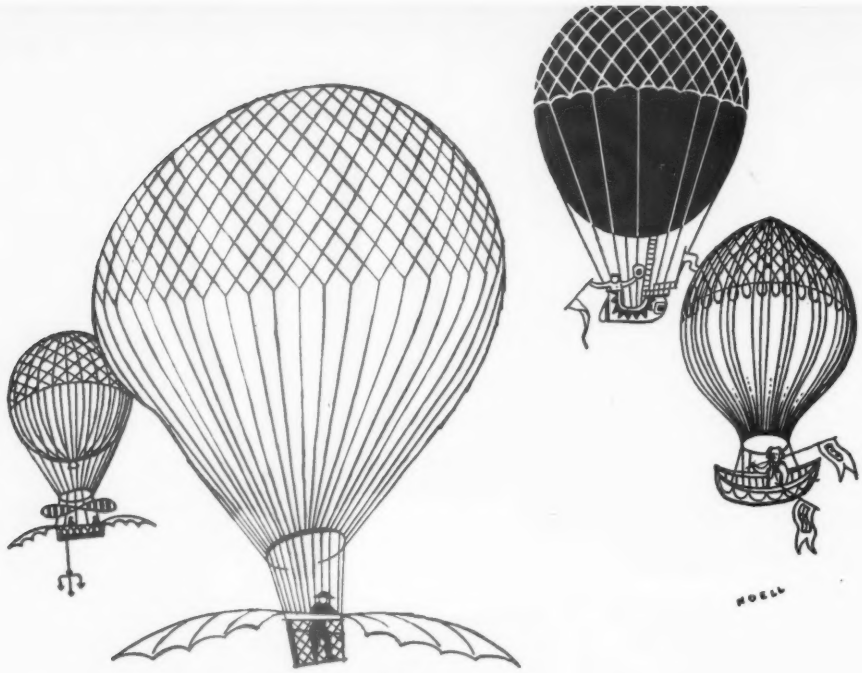
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